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PESTICIDES ABSTRACTS (formerly Health Aspects of Pesticides Abstract Bulletin) is a monthly publication of the Technical Services Division of the Office of Pesticide Programs, Environmental Protection Agency.

The purpose of this publication is to foster current awareness of the major worldwide literature pertaining to the effects of pesticides as defined in the Table of Contents. The publication represents a monthly review of more than 2,000 primary and secondary sources. A list of periodicals from which articles have been abstracted appears annually in the January issue. Subjects and authors of abstracted articles are cross-referenced in quarterly and annual indexes. Reprint requests should be directed to the author of the complete article.

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79-0751. Anonymous **Pesticide industry in prospect.** *Aust. Sugar J.* 70(4): 189-190; 1978.

The demand for food is viewed as being an increasing one in the future, even with possible changes in dietary habits. The expense involved in pesticide research and development is extremely high. The ability of the pesticide industry to satisfy future food requirements will depend on its ability to put enough funds into research. Since 1973 the costs of producing pesticides have risen at about twice the rate of price increases. The future of plant growth regulators and other new avenues of pest control are explored. However, the determining factor to whether any advancement will occur in these fields lies in whether the industry itself can continue to be a profitable enterprise.

79-0752. Pimentel, D.; Krummel, J.; Gallahan, D.; Hough, J.; Merrill, A.; Schreiner, I.; Vittum, P.; Koziol, F.; Back, E.; Yen, D.; Fiance, S. (New York State Coll. Agric. & Life Sci., Cornell Univ., Ithaca, NY 14853) **Benefits and costs of pesticide use in U.S. food production.** *BioScience* 28(12): 772, 778-784; 1978. (75 references)

A discussion is presented on the current status of pesticide use in the United States. Thirty-four percent of the cropland is treated with herbicides, 12% with insecticides, and 2% with fungicides. Use varies with geographic location. For example, in the mountain region, 65% of the potato acreage is treated with insecticide, while in the South, 100% of the potato acreage is treated. There is an estimated 33% annual crop loss due to pests (13% to insects, 12% to pathogens and 8% to weeds). It is predicted that without pesticides, loss would increase to 42%. The return per dollar invested in pesticide control is estimated to be 4 dollars. Alternative non-chemical controls are discussed, including crop rotation, development of pest- and disease-resistant strains, and control by use of natural enemies.

79-0753. McEwen, F. L. (Dep. Environ. Biol., Univ. Guelph, Guelph, Ont., Canada) **Food production: The challenge for pesticides.** *BioScience* 28(12): 773-777; 1978. (35 references)

A review is presented in which various topics concerning the need for pesticides to increase food production are discussed. Losses of specific crops due to insects are detailed; as much as 27% of the world's rice crop was lost to insects, while other crops had the greatest losses due to weeds or disease. Pesticides are purported to be a major factor in permitting certain crops (fruits, onions) to be available in quantity. It is accepted that pesticides have a tremendous potential for environmental harm, but when managed properly, can increase greatly the world's food production.

79-0754. Banks, H. J.; Desmarchelier, J. M. (Div. Entomol. CSIRO, Canberra, Australia) **New chemical approaches to pest control in stored grain.** *Chem. Aust.* 45(8): 276-281; 1978. (26 references)

A review is presented of recent chemical and physicochemical research in the area of pest control of stored grain. Malathion, pyrethrum, carbaryl, and dichlorovos are among the pesticides mentioned. The influence of water vapor, temperature, and moisture content on pesticide breakdown is discussed, along with intergranular phenomena. The current status of control in the Australian grain industry is summarized.

79-0755. Tulp, M. T. M.; Hutzinger, O. (Lab. Environ. & Toxicol. Chem., Univ. Amsterdam, Amsterdam, The Netherlands) **Some thoughts on aqueous solubilities and partition coefficients of PCB, and the mathematical correlation between bioaccumulation and physico-chemical properties.** *Chemosphere* 7(10): 849-860; 1978. (73 references)

A discussion is presented on the low water solubilities of organic compounds and the consequent undesirable properties, primarily bioaccumulation. Determination of solubility is made difficult by many factors that affect it. Examples from the literature were given in which tremendous variations in solubilities were reported. The presence of electrolytes, colloidal, micellular or particulate formation, variations in filtration or centrifugation all cause variations in results. A mathematical treatment of the solubility and partitioning coefficients is presented for polychlorobiphenyls. The mathematical relationship between water solubilities and bioaccumulation is also presented.

79-0756. Bishun, N.; Smith, N.; Williams, D. (Tissue Cult. & Cytogenet. Unit, Res. Dept., Marie Curie Mem. Found., Surrey, England) **Mutations, chromosome aberrations and cancer.** *Clin. Oncol.* 4(3): 251-263; 1978. (18 references)

A review is presented, covering the correlation between mutagenesis, clastogenesis, and carcinogenesis produced by many commonly used drugs, cosmetics, pesticides, food preservatives, pollutants and oral contraceptives. Mutagenic pesticides include ethylene oxide, captan, ethylene dibromide, and chlordane; the latter three have also been shown to be carcinogenic in rats. No data were presented on safe levels of pesticides or doses necessary to elicit mutagenic or carcinogenic responses.

79-0757. Carrieri, V. (Dep. Health Lombardi, Milan, Italy) **Review of the events which occurred in Seveso.** In: *Dioxin: Toxicological and Chemical Aspects.* Cattabeni, F., Cavallero, A., Galli, G., eds (Spectrum Publ., Inc.: NY) Chapter 1: 1-5; 1978.

An assessment was made of the effects of the July 10, 1976 explosion in the ICMESA factory near Seveso, Italy. The "parasitic" explosion released numerous chemicals, inlcuding 2,3,7,8-tetrachloro dibenzo-*p*-dioxin (TCDD). The amount of deposited toxic substance has been calculated to vary from 450 g to 3 kg. Highly polluted areas (Zone A) with TCDD concentrations > 0.01 ppm, and a lower pollution Zone B (TCDD < 0.01 ppm) areas have been defined. The populaton of Zone A (202 families, comprising 730 people) have been evacuated prior to decontamination; 16 cases of

dermatological cases were directly attributable to TCDD, with another 500 suspected cases. A 5-yr health plan included defining high risk areas, relocation of children and pregnant women, decontamination of buildings, destruction of vegetation, and removal of a 10 cm top soil layer. Strict hygiene among the population was strongly urged.

79-0758. Rappe, C. (Dep. Org. Chem., Univ. Umea, Umea, Sweden) **2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)-introduction.** In: *Dioxin: Toxicological and Chemical Aspects.* Cattebeni, F., Cavallaro, A., Galli, G., eds. (Spectrum Publ., Inc.: NY) Chapter 2: 9-11; 1978. (12 references)

An introduction to the chemistry and history of TCDD is given. The first chlorinated dioxin was produced in 1872, TCDD was first synthesized in 1957. Of the 22 possible tetrachlorinated dioxins, 4 have been described in the literature. TCDD can be prepared by pyrolysis of 2,4,5-trichloro phenyl and 2,4,5-trichloro phenoxy acids (2,4,5-T). Uncontrolled reactions during the industrial preparation of 2,4,5-trichlorophenol have resulted in severe accidents in several countries.

79-0759. Erne, K. (Natl. Vet. Inst. Stockholm, Sweden) **The phenoxy acid problem in Sweden and a possible dioxin problem - a review.** In: *Dioxin: Toxicological and Chemical Aspects.* Cattabeni, F., Cavallero, A., Galli, G., eds. (Spectrum Publ, Inc: NY) Chapter 9: 101-103; 1978. (3 references)

The effects of phenoxy acids (2,4-D; MCPA; 2,4,5-T) used in agricultural weed control are reviewed. Numerous causes of damage or death in domestic and wildlife species are thought to be associated with these herbicides. Reindeer deaths and abortions in Swedish Lapland occurred following aerial spraying of the grazing area with 2,4-D and 2,4,5-T. While 0.5 ppm phenoxy acid concentratoins were found in tissues of dead animals, conclusive evidence of poisoning could not be obtained. No abortions or deaths were observed in pregnant or neonatal reindeer in simulated feeding experiments. Toxic dioxins may be formed from these herbicides through thermal or photochemical processes.

79-0760. Smeets, J. (Div. Prev. Pollut. & Nuisances, Air & Chem. Subst., Comm. Eur. Communities, Brussels, Belgium) **Ecotoxicological aspects of the European environmental action programmes.** *Ecotoxicol. Environ. Saf.* 2(2): 143-150; 1978.

Specific conceptual considerations of European environmental action programs are presented, along with a review of some actual ecotoxicological studies. The purpose of these programs is to improve the methods of evaluating the risks to human health and the environment from pollution. A variety of approaches were considered, primarily: determining the origin and emission of pollutants; determining total exposure; evaluating the dose; determining the effect; and developing sampling methods. Provided there are sufficient grounds, the final step suggested is translating these studies into legislative action for setting environmental standards. [At the 5th International Symposium "Chemical and Toxicological Aspects of Environmental Quality", Munich, 1977]

79-0761. Harvey, G. R.; Steinhauer, W. G. (Woods Hole Oceanogr. Inst., Woods Hole, MA 02543) **Biogeochemistry of PCB and DDT in the North Atlantic.** *Environ. Biogoechem.* 1: 203-221; 1976. (11 references)

Concentrations of DDT, DDE, and PCB in ocean organisms, water, and sediments were studied to determine the environmental impact of these man-made constituents. Analyses were done by extraction and gas chromatography methods. The small quantities of total DDT which reach the ocean are incorporated into horizontal and vertical food chains. However, body concentrations do not change from upper ocean to deep benthos organisms. Small portions of DDT are adsorbed on particles which are directly deposited as sediments. The DDT appears to be a minor environmental hazard. PCB's transported to the oceans as aerosol droplets are resistant in the sediments and the water column. PCB is biologically degraded, with 0.1% appearing in marine organisms. A significant amount of PCB appears to be reevaporated into the atmosphere. [At the 2nd International Symposium on Environmental Biogeochemistry]

79-0762. Peakall, D. B.; Norstrom, R. J.; Hallet, D. J.; Fox, G. A.; Gilman, A. P. (Natl. Wildl. Res. Cent., Ottawa, Ont, K1A OE7, Canada) **Pesticides - mirex.** *Environ. Sci. Technol.* 12(13): 1348; 1978.

In this letter to the editor the author criticizes references made in an earlier published article (See *Pesticide Abstracts*, Vol. 11, No. 8. Abstract no. 78-1756) concerning the residue levels and biological effects of such residues of mirex in birds. No evidence exists which can support the claim that crossed bills are caused by mirex. An implication that Caspian Terns have been misrepresented as Herring Gulls is noted. Reports on the role of mirex and photomirex in the reproductive failure, behavioral abnormalities or teratogenic effects which are noted in Lake Ontario fish-eating birds are not supported by facts. Implications concerning the migratory patterns of these birds are misleading. The discussion of mirex levels in falcons is seen as highly suspect.

79-0763. Gosalvez, M.; Diaz-Gil, J. J. (Bioquim. Exp., Clin. Puerta Hierro, Univ. Autonoma, Madrid, Spain) **Rotenone: A possible environmental carcinogen?** *Eur. J. Cancer* 14(12): 1403-1404; 1978. (9 references)

Information is reported on the use of rotenone as an insecticide, pesticide, and piscicide. Since this compound has been previously reported to be carcinogenic in rats, the authors propose that rotenone be considered an environmental carcinogen. A brief literature review is presented on levels of rotenone used in the United States, the routes by which it enters drinking water, and the routes by which it is ingested by humans.

79-0764. Datta, S.; Banerjee, P. (Dep. Entomol., Bidhan Chandra Krishi Viswa Vidyalaya, Kalyani 741235, India) **Prostaglandins, cyclic-AMP, U-7118 & acetic acid as insect growth regulators & sterilants.** *Indian J. Exp. Biol.* 16(8): 880-883; 1978. (25 references)

Early 5th instar nymphs and eggs of the red cotton bug, *Dysdercus* sp. were topically treated with 0.1% (prostaglandins (PG), 0.2% *c*AMP, 0.1% U-7118, and 1.0% acetic acid. The mating period of the animals was increased significantly with PG and *c*AMP exposures. The other chemicals reduced the mating duration significantly. The number of eggs laid was markedly reduced except in the case of those animals exposed to U-7118. There was also a significant reduction in the fertility of these eggs. Nymphs from *c*AMP treated eggs did not develop into adults. Sterility was also noted here. Treatment of the 2-day old eggs with E and F series of PG markedly reduced hatching. In cross mating experiments with treated males and untreated females a significant inhibition of fecundity and fertility were noted.

79-0765. Mel'nikov, N. N. (All-Union Sci. Res. Inst. Chem. Plant-Prot. Agents, Leningrad, USSR) **Okhrana vodnykh resursov ot zagryazneniya pestitsidami. [Protecting water resources against contamination by pesticides.]** *Khim. Sel'sk. Khoz.* (9): 35-40; 1978. (23 references) (Russian)

The general problems of the pollution of water resources by pesticides and ways of preventing it are reviewed. Fresh water can be contaminated by pesticides due to atmospheric washout, runoff from treated fields, entrainment by wind during treatment, and accidental spills in manufacturing plants. Some pesticides are highly persistent in water and aquatic organisms, and accumulate in the trophic chain. The hazards of water pollution by pesticides can be diminished by the use of granulated and microencapsulated preparations and small-volume sprays. It will be necessary to develop non-cumulating pesticides with low toxicity and high degradability.

79-0766. Cueto, C. (Pestic. Res. Div., ARS, Washington, DC) **Pharmacological approach to toxicology.** *Natl. Tech. Inform. Serv.* PB-279,278: 1p; 1977.

The technical literature on pesticides indicates there is extensive work being conducted and published on methods of analysis, extent of human exposure, symptomatology of poisoning and levels of pesticide residues in biological tissues and residues in all phases of our environment. A limited review of the literature established the need for greater emphasis on more properly controlled studies on the biological significance of pesticide residues. These studies should keep pace with the extensive development of chemical methodology and its applications. Since the general public is exposed to low levels of pesticides, biological studies must emphasize the possible effects of pesticides on the functional aspects of sensitive physiological systems. Application of pharmacological methodology to these functional systems would facilitate a more sensitive evaluation of possible toxic effects. (Auther abstract by permission)

79-0767. Baron, R. L. (Health Effects Res. Lab., US EPA, Research Triangle Park, NC 27711) **Pesticide induced delayed neurotoxicity - proceedings of a conference.** *Natl. Tech. Inform. Serv.* PB-256,416: 309p; 1976. (218 references)

A delayed neurotoxicity syndrome, shown to be induced by certain organophosphorus esters, was first reported almost 50 years ago. The 1975 Guidelines for Registering Pesticides in the United States reflect a continuing concern for this problem in the recommendations made for evaluating the delayed neurotoxicity hazard associated with organophosphate pesticide use. This conference was designed to bring together those individuals interested in the organophosphorus-ester-induced neurotoxicity syndrome to stimulate discussions and to evaluate the latest scientific results. With the aid of formal and informal presentations, new pathways for investigation are becoming apparent which may lead to the understanding and elimination of this problem. (Author abstract by permission)

79-0768. Tanaka, J. (Inst. Fish., Tokai Reg., Shizuoka, Japan) **[On the toxicity of agricultural chemicals (pesticides) on fishes.]** *Seitai No Kagaku (Environ. Ecol. Chem.)* 1(3): 149-156; 1978. (57 references) (Japanese)

The table on toxicities of registered agricultural chemicals published in 1978 by the Agricultural Chemicals Inspection Station of the Ministry of Agriculture, Forestry and Fishery is explained. The table contains chemicals classified as A slightly, B, intermediate in toxicity and B-S, subdivided into three classes of *a* (TLm less than 2 ppm to carp 48 hr), *b* (TLm less than 0.5 ppm to fishes other than carp), and *c* (not fatal but effective to killifish at less than 0.5 ppm). C and D include the pesticides endrin, telodrin (isobenzan), benzoepin (endosulfan), rotenone, and PCB. In the author's opionin, those classified as A, such as ethylene dibromide, and those classified as B such as EPN, mecarbam and organocopper fungicides should be classified respectively to B and C. Furthermore, those classified as B, such as salithion, and dimethoate, and those classified as C, such as propargite, should be classified respectively to A and B. Literally, the above-mentioned table has only four classification slots of A,B,C, and D, however, the author supplemented the classification of B-S according to "Agriculture Chemicals Manual 1977" published by the Japanese Society for Plant Protection, Tokyo, Japan.

79-0769. Ohisa, N.; Yamaguchi, M. (Dep. Agric. Chem., Univ. Osaka Prefect., Sakai, Osaka 591, Japan) **Degradation of gamma-BHC in flooded soils enriched with peptone.** *Agric. Biol. Chem.* 42(11): 1983-1987; 1978. (19 references)

Soils had an ability to decompose BHC when they were kept in flooded condition, and the ability was remarkably enhanced with peptone. Every tested soil was affected by the addition of peptone, and it was suggested to be due to the increase of BHC decomposers in the soil. The BHC decomposer predominating in the soil-peptone culture preferred an anaerobic condition and was heat-resistant, being able to decompose α- as well as γ-BHC (lindane). Several anaerobic bacteria were isolated from the soil-peptone culture as BHC decomposers, and these decomposers were tentatively identified as species of *Clostridium* from several characteristic features. (Author abstract by permission)

79-0770. Cullimore, D. R.; Ball, L. (Microbiol. Unit, Dep. Biol., Univ. Regina, Sask. S4S OA2, Canada) **New monitoring system for proteolysis in soil as influenced by selected herbicidal applications.** *Appl. Environ. Microbiol.* 36(6): 959-961; 1978. (4 references)

Proteolysis in soil (Regina heavy clay) was monitored by the gelatinolytic etching of developed color film emulsion, using a film immersion-slide carrier technique. Etching followed a sigmoid curve to completion. A total of 11 herbicides were tested for their potential influence on this proteolytic function. Eight caused some inhibition, and two were stimulative at 200 μl of applied herbicide per liter. Eptam (EPTC) was found to stimulate at low concentrations and inhibit at higher concentrations ($>$ 1000 μl of applied eptam per liter. (Author abstract by permission)

79-0771. Hsu, T. S.; Bartha, R. (Rhizosphere Res. Group, New Jersey Agric. Exp. Stn., Rutgers Univ., New Brunswick, NJ 08903) **Accelerated mineralization of two organophosphate insecticides in the rhizosphere.** *Appl. Environ. Microbiol.* 37(1): 36-41; 1979. (23 references)

Numerous xenobiotic compounds, including the organophosphate insecticides *O,O*-diethyl- *O*-(2-isopropyl-6-methyl- 4-pyrimidinyl) phosphorothioate (diazinon) and *O,O*-diethyl- *O*-*p*-nitrophenyl phosphorothioate (parathion), appear to be degraded in the soil environment by an initial cometabolic attack. Comparing the mineralization rates of radiolabeled diazinon and parathion in root-free and in rhizosphere soil, we tested our hypothesis that, because of the presence of root exudates, the rhizosphere is an especially favorable environment for such cometabolic transformations. The insecticides were added individually at 5 μg/g to sealed flasks containing either soil permeated by the root system of a bush bean plant or identical soil without roots. Periodically, the flasks atmospheres were flushed through traps and the evolved $^{14}CO_2$ was quantified. Bush bean plant roots without associated rhizosphere microorganisms failed to produce a significant amount of $^{14}CO_2$. During 1 mo of incubation, rhizosphere flasks mineralized 12.9 and 17.9% of the added diazinon and parathion radiocarbon, respectively, compared to 5.0 and 7.8% by the soil without roots. The mineralization of parathion but not of diazinon was stimulated in a similar manner when soil without roots was repeatedly irrigated with a root exudate produced in aseptic solution culture. Viable counts of microorganisms on soil extract agar were not significantly altered by root permeation or by root exudate treatment of the soil, leaving population selection and/or enhanced cometabolic activity as the most plausible interpretations for the observed stimulatory effects. Rhizosphere interactions may substantially shorten the predicted half-lives of some xenobiotic compounds in soil. (Author abstract by permission)

79-0772. Priebe, K. (Staatl. Vet. Amt. Bremerhaven, Bremerhaven, BRD) **Uber Ergebnisse von Rueckstandsuntersuchungen bei Seefischen. [Results of residue analyses in marine fishes.]** *Arch. Lebensmittelhyg.* 29(5): 161-164; 1978. (23 references) (German)

Results of mercury and DDT residues analyses in marine fishes are presented. The biological half-life of mercury is 400 days in shrimp, 700-1200 days in flounder, 910-1030 days in eels, versus 60-80 days in humans and 16 days in rats. These figures indicate that mercury is accumulated in the body of marine organisms, and that the mercury residue level is closely correlated with their age. The highest mercury levels are currently found in halibut, sharks and perch. The DDT residue levels average 0.1 mg/kg in lean fish and 0.2 mg/kg in fat fish from the North Sea and North Atlantic, up to 0.3 mg/kg in lean fish and 0.8 mg/kg in fat fish from the Baltic. The DDT levels range from 5 to 60 mg/kg in cod liver with oil contents over 50%. Unlike mercury, there is a less marked correlation between DDT residue levels and age.

79-0773. Schrauzer, G. N.; Katz, R. N. (Dep. Chem., Univ. California San Diego, La Jolla, CA 92093) **Reductive dechlorination and degradation of mirex and Kepone with vitamin B_{12}s.** *Bioinorg. Chem.* 9: 123-143; 1978. (12 references)

Studies were carried out on the reductive dechlorination of mirex and Kepone (chlordecone). Reactions of both compounds to vitamin B_{12}s were studied under catalytic and stoichiometric conditions. Mirex reactions were straightforward, resulting in $C_{10}C_{12}$-nHn (n=18) compounds. Kepone, on the other hand, underwent extremely complex reactions which have not been fully resolved. Lindene derivatives C_9Cl_8-nH (n=3-5), were formed. Vitamin B_{12}s induces fragmentation of Kepone into $C_3Cl_3H_2$ residues attached to the cobalt atom, under mild reducing conditions. Under strong alkaline conditions, the reaction yields high molecular weight compounds, but their compsotion is unknown.

79-0774. Webster, G. R. B.; Shaykewich, C. F.; Kanhai, S.; Reimer, G. J. (Dep. Soil Sci., Univ. Manitoba, Winnipeg, Manitoba R3T 2N2, Canada) **Availability of the herbicide trifluralin for control of wild oats as influenced by soil char-**

acteristics in four Manitoba soils. *Can. J. Soil Sci.* 58(3): 397-401; 1978. (20 references)

The effects of soil properties on available phytotoxic residues and total extractable residues of the herbicide trifluralin were investigated in four Manitoba soils. The four soils, Red River heavy clay, Gladstone clay loam, Newdale loam, and Almasippi loamy sand, were treated with trifluralin at levels in the range of 0.2-3.0 ppmw (dry weight soil), and the soils were maintained at or near field capacity in the growth chamber. Available residues were determined at 0, 2, and 5 wk using a wild oat (*Avena fatua*) bioassay. Total residues were measured at regular intervals to 16 wk using ultrasonic extraction and gas-liquid chromatography analysis. Biological results showed that wild oat control expressed as ED50 required much less applied or residual trifluralin in Almasippi loamy sand than in Red River heavy clay, with the other two soils being intermediate. Total residues, on the other hand, remained highest in Red River heavy clay, although the differences between soil types were not great. Net loss of trifluralin was best explained by a first-order kinetic expression. Availability of phytotoxic residues was related mathematically to clay content of the soils in combination with time from application. It was further shown that bioassay is inadequate for determination of total residues in soils unless time from application is held constant. (Author abstract by permission)

79-0775. Lamoreaux, R. J.; Newland, L. W. (Dep. Biol., Texas Christian Univ., Fort Worth, TX 76129) **The fate of dichlorvos in soil.** *Chemosphere* 7(10): 807-814; 1978. (26 references)

Several studies were carried out to determine the fate of dichlorvos in soil and the factors responsible for the loss of the pesticide during soil perfusion. Bacterial breakdown was accomplished by pure cultures of *Bacillus cereus*. Soil perfusion studies were carried out by continually perfusing a column of soil with an aqueous solution containing 1000 mg/l dichlorvos. The rate of absorption was determined by periodic sampling of the soil. The rate of degradation was directly related to the presence of *B. cereus* and to the pH. Additional phosphorus was necessary to aid bacterial breakdown of the pesticide. After 10 days, 50% of the dichlorvos was recovered. Soil adsorption and chemical degradation account for 70% of the rapid disappearance of the pesticide.

79-0776. Simon-Sylvestre, G. (Stn. Sci. Sol, I.N.R.A., F-78000 Versailles, France) **Effects of pesticides on the organic matter degradation consequences on the soil structural stability.** *Chemosphere* 7(10): 821-826; 1978. (7 references)

Studies were performed to determine the effects of metoxuron on the stability of soil structure. Air dried soil was enriched with organic matter, then treated with the pesticide at rates 20 and 200 time the normal rate. The benzene test was used to determine quantitative and qualitative variations of the organic matter of the soil. The rates of stable aggregates decreased by half in the samples treated with metoxuron.

79-0777. Rajukkannu, K.; Saivaraj, K.; Vasudevan, P.; Balasubramanian, M. (Pestic. Residue Lab., Tamil Nadu Agric. Univ., Coimbatore 3, India) **Residues of methyl parathion, quinalphos, phosalone and fenitrothion in/on okra.** *Curr. Sci.* 47(20): 782-783; 1978. (3 references)

Okra crops were sprayed with phosalone (0.70 kg AI/ha), quinalphos (0.50 kg AI/ha), methyl parathion (0.50 kg AI/ha), or fenitrothion (1.00 kg AI/ha) three times in a randomized block design. On the day of application, residues of methyl parathion, quinalphos, phospalone and fenitrothion in/on the okra fruits were 10.50, 5.50, 7.42, and 3.76 ppm, respectively. This decreased until day 7 after application when the values were 0.60, ND (not detectable), 1.30, and 0.53 ppm, respectively. The half life values were highest for quinalphos, then phosalone and fenitrothion, then methyl parathion.

79-0778. Rajukkannu, K.; Saivaraj, K.; Vasudevan, P.; Balasubramanian, M. (Pestic. Residue Lab., Tamil Nadu Agric. Univ., Coimbatore 3, India) **Carbofuran and aldicarb residues in green chillies.** *Curr. Sci.* 47(20): 784; 1978. (2 references)

Carbofuran and aldicarb were applied to soil as a band at 1.25 kg AI/ha at the time of high pest incidence on green chillies. Application of the chemicals was followed by irrigation. At fortnightly intervals all the green chillies were harvested and the residues of the two chemicals assessed. Carbofuran residues measured at 15, 30, 45, and 60 days after treatment were 2.80, 0.65, 0.28 ppm, and below the detection limit, respectively. At similar times the residues of aldicarb determined were 1.66, 0.89, 0.36, and 0.09 ppm, respectively. Residue levels in the fruit, at 45 days post-application, were above the tolerance levels for both pesticides. Fruits harvested after 60 days were well below the tolerance limits.

79-0779. Akermark, B. (Dep. Org. Chem., Royal Inst. Technol., Stockholm, Sweden) **Photodechlorination of haloaromatic compounds.** In: *Dioxin: Toxicological and Chemical Aspects.* Cattabeni, F., Cavallaro, A., Galli, G., eds., (Spectrum Publ., Inc: NY) Chapter 19: 191-193; 1978.

The experimental dehalogenation of 1,2,4-trichlorobenzene by direct or sensitized irradiation yields different isomer distributions. Only high energy sensitizers, like acetone, promote dehalogenation; others (benzophenone) act as stabilizers. The presence of a hydrogen donor is necessary for the photodecompositon reaction. Accidentally released TCDD, present at the soil surface, is decomposed by sunlight provided that a suitable H donor is present.

79-0780. Liberti, A.; Brocco, D.; Allegrini, I.; Bertoni, G. (Lab. Sull-Inquinamento Atmos. C.N.R., Rome, Italy) **Field photodegradation of TCDD by ultra-violet radiations.** In: *Dioxin: Toxicological and Chemical Aspects.* Cattabeni, F., Cavallaro, A., Galli, G., eds. (Spectrum Publ. Inc: NY) Chapter 20: 195-200; 1978. (4 references)

Photodegradation of TCDD under field conditions

occurs rapidly if the contaminated surfaces are wetted with a suitable solvent. This can be done by the spraying with hydrogen-donor solutions such as ethyl oleate and xylene. Photodegradation energy sources include high pressure Hg lamps, UV lamps, or direct sunlight.

79-0781. Wipf, H. K.; Homberger, E.; Neuner, N.; Schenker, F. (Givaudan Res. Co. Ltd., CH-8600 Dubendorf, Switzerland) **Field trials on photodegradation of TCDD on vegetation after spraying with vegetable oil.** In: *Dioxin: Toxicological and Chemical Aspects.* Cattabeni, F., Cavallaro, A., Galli, G., eds. (Spectrum Publ. Inc.: NY) Chapter 21: 201-217; 1978. (5 references)

An environmentally acceptable hydrogen donor for UV-induced decontamination of TCDD in Seveso soil is suggested. Two formulations of olive oil (80% olive oil + 20% cyclohexanone and a 40% aqueous emulsion) were tested by ground and air applications. No significant leaching of the oil and dissolved TCDD into the ground was observed after 200 mm artificial rainfall.

79-0782. Alnaji, L. K. (Kansas State Univ. Agric. Appl. Sci., Manhattan, KS 66506) **Effectiveness of methyl phoxim and malathion on stored grain insects and the fate of the insecticide residues on the properties of the grain products.** *Diss. Abstr. Int. B* 39(5): 2117; 1978.

Samples of soft red winter wheat were treated with different concentrations of methyl phoxim, or 10 ppm malathion as protection against insect infestation during storage. Bioassay tests, using *Sitophilus oryzae* (L.), rice weevil, *Rhyzopertha dominica* (F.), lesser grain borer, *Tribolium confusum* duVal, confused flour beetle, and *Tribolium castaneum* (Herbst), red flour beetle, were conducted to determine the effectiveness of the treatments in protecting the grain against insect attack. The amount of residues in the treated grain were analyzed by means of gas-liquid chromatography. The highest methyl phoxim deposits remained in the 6% grain moisture level during the 30 days study, however, the residues were markedly reduced at the higher moisture content of the grains. A germination test 1, 180, and 365 days after treatment revealed that methyl phoxim residues did not affect wheat germination. Malathion and methyl phoxim residues were analyzed in treated wheat of 12.5% moisture content during the 365 days of storage. Methyl phoxim degraded rapidly during the first 30 days, but thereafter, loss was gradual; 91.8% of methyl phoxim and 85% of malathion degraded by the end of the study period. The determination of malathion and methyl phoxim residues after milling showed that greater residues of both insecticides were found in the bran and shorts and very small amounts in the flour. The loss of residues during milling were 8% to 10% for methyl phoxim and 5% to 7% for malathion residues. There were no changes in water absorption of flour, dough mixing tolerance, and the dough development time between samples treated and untreated samples. Chlorine bleaching at the rate of 2 oz/100 of soft wheat flour resulted in 52.02% to 55.5% loss in methyl phoxim residues and 32.3% to 45.6% loss in malathion residues. Bleached flour was used in cake making. Cake samples were baked at 375°F for 28 min. Baking at this temperature resulted in a 91.31% to 100% loss in methyl phoxim residues and 72.5% to 94.9% loss in malathion residues. There were no significant differences in cake volume or internal texture, between cake samples made from treated or untreated wheat. (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms, order No. 7821853.)

79-0783. Tucker, C. S. (Auburn Univ., Auburn, AL 36830) **Consequences of copper-sulfate and simazine treatment for phytoplankton control in fish ponds and studies on the dissipation of simazine in laboratory microcosms.** *Diss. Abstr. Int. B* 39(6): 2650; 1978.

Treatment of channel catfish (*Ictalurus punctatus*) production ponds biweekly with 0.84 kg/ha copper sulfate was ineffective in reducing phytoplankton density. Application of 13.4 kg/ha simazine to the bottoms of catfish ponds prior to flooding resulted in decreased chlorophyll *a* values and a reduction in coverage by macrophytes. However, treatment of catfish ponds with simazine, either added to the water or as a preflooding treatment, resulted in extended periods of low dissolved oxygen concentrations, up to a 20% reduction in catfish yields, and poorer conversion of feed when compared to control ponds. A single application of 1.5 mg/l simazine to the water of fertilized bluegill (*Lepomis macrochirus*) ponds also decreased chlorophyll *a* values, coverage by macrophytes, and dissolved oxygen concentrations. Bluegill yields were not affected significantly ($P > 0.05$). Laboratory studies showed that the presence of pond sediment greatly increased the rate of simazine loss when compared to systems containing pond water alone. Biological and non-biological processes are both important in the loss of simazine from sediment-water laboratory systems. Sediment pH, percentage organic matter, and percentage sand are correlated ($P \leq 0.05$) with simazine half-life. Highest simazine concentrations and persistence of simazine in the water overlying sediments treated with 13.4 kg/ha one day prior to flooding with water were positively correlated with percentage sand and negatively with percentage silt and clay. There was no difference in the amount of simazine released from sediments flooded 1 or 4 days after treatment with 13.4 kg/ha simazine. However, when nine days elapsed between treatment and flooding, there was less simazine released from sediments. (Author abstract by permission. Copies of the thesis are available from University Microfilms, order No. 7824034.)

79-0784. Daorai, A. (Univ. Maryland, College Park Campus, MD 20742) **Behavior of methyl parathion in an aquatic model ecosystem.** *Diss. Abstr. Int. B* 39(6): 2651; 1978.

Desorption of the insecticide methyl parathion from submerged soils was studied using daphnids as the indicator of toxic levels in water. The amount of methyl parathion in water from treated Matapeake silt loam soil and Lakeland sandy loam soil reached equilibrium in 3 and 7 days, respectively. Ultraviolet light and microorganisms in soil might

have some direct and indirect effects on daphnids, but ultraviolet light showed no effects on the toxicity of methyl parathion to the daphnids. Toxicity of methyl parathion to snails was also studied. Several organisms in a model ecosystem were exposed to [^{14}C]-ring-labeled methyl parathion for up to 30 days to determine distribution and bioaccumulation potential in the aquatic environment. In snails, the total ^{14}C residues increased with time; in daphnids and algae, the total ^{14}C residues increased up to 15 days and leveled off at 30 days. But in fish, the residues dropped after the first day, then went up again at 30 days. Methyl parathion, methyl paraoxon, *p*-nitrophenol, polar compounds, and some unknown products were found in water, soil, fish, and snails. An experiment was carried out to determine the relative importance of absorption from solution vs. consumption of contaminated food by fish. Accumulation from solution appeared to be more important than consumption of one food chain organism by another. *Gambusia* absorbed the residues about twice as much as bluegills, but both species displayed the same pattern of accumulation. Methyl parathion, methyl paraoxon, *p*-nitrophenol, polar compounds, and an unknown compound were found in soil. All the compounds found in soil plus two more unknown compounds were found in water and both species of fish. The nature of the residues in fish fed contaminated food was similar to the composition of the residues in the food. (Author abstract by permission. Copies of the thesis are available from University Microfilms, order No. 7824009.)

79-0785. Parlar, H. (Inst. Oekol. Chem., Gesellsch. Strahlen. & Umweltforsch. mbH, Munich, BRD) **Organochlorine compounds and their reactions in the atmosphere.** *Ecotoxicol. Environ. Saf.* 2(2): 219-232; 1978. (13 references)

A series of studies were carried out to determine the reactions that selected organochlorine compounds (DDT, DDE and PCP) undergo in the upper atmosphere. Temperature and radiation as well as concentrations of the reactive gasses NO_2, O_3, and O_2 were controlled at levels found in the troposphere. Photophysical and photochemical reactions were determined, including dipole transition, radiation-free transfer and energy transfer.

79-0786. Waller, W. T.; Lee, G. F. (Eng. Res. Cent., Colorado State Univ., Fort Collins, CO 80523) **Evaluation of observations of hazardous chemicals in Lake Ontario during the International Field Year for the Great Lakes.** *Environ. Sci. Technol.* 13(1): 79-85; 1979. (9 references)

Data collected during the International Field Year for the Great Lakes (IFYGL) studies on Lake Ontario are summarized relative to either recommended International Joint Commission (IJC) Water Quality Objective Subcommittee water quality objectives or U.S. Environmental Protection Agency Quality Criteria for Water, of July 1976. Data from 247 stations were used to summarize information on the following parameters: cadmium, zinc, chromium, copper, fluoride, iron, lead, nickel, manganese, and ammonia. Chlorinated hydrocarbon data for DDT, dieldrin, and PCB are discussed relative to concentrations determined in water samples and three fish species. Summaries indicate that almost all reported measurements for total cadmium, regardless of the region of the lake from which the samples were collected (i.e., open water, shoreline, or river mouth), exceed the IJC water quality objective of 0.2 μg/l by at least five times. Values reported for copper also showed a high percentage of measurements from all regions of the lake equal to or in excess of the recommended IJC water quality objective. Other metals showed more regional patterns of values equalling or exceeding water quality objectives. the concentrations of PCB, dieldrin, and DDT and its metabolites in Lake Ontario water and fish were found to exceed the IJC water quality objectives and the US EPA water quality criteria. (Author abstract reprinted by permission of the American Chemical Society.)

79-0787. Peter, M. B. (Author address not given) **Nursing mothers and environmental contaminants.** *EPA J.* 4(10): 13, 39; 1978.

Diets of pregnant women were examined to determine whether there has been a correlation between their diets during pregnancy and the amount of pesticide levels in the breast milk they produce. Studies are currently underway to determine the distribution of various particular organochlorine pesticide levels in human milk among nursing mothers giving birth in general care hospitals in the US. Compounds analyzed in this study include DDT, dieldrin, chlordane, heptachlor, heptachlor epoxide, mirex, oxychlordane, BHC, HCB (hexachlorobenzene), transnonachlor and polychlorinated biphenyls. Dieldrin appeared in 80% of the milk samples, heptachlor epoxide in about 63% and oxychlordane in 74%. The use of these pesticides has been curbed. Current research is also being done on dioxin (TCDD) a highly toxic chemical contaminant of 2,4,5-T, a herbicide. Levels of dioxin in human milk are being tested. Studies from agencies other than the EPA are also noted. Possible effects of geographical and occupational differences on pesticide contamination of the human body are also being investigated.

79-0788. Smith, S. W. C. (Commonw. Dep. Health, Woden, ACT 2606, Australia) **Pesticide residues in the total diet.** *Food Technol. Aust.* 30(9): 349-352; 1978.

A survey of pesticide residues in Australian foodstuffs in the year 1970 demonstrated that, in general, the intake of pesticides in the Australian diet would not exceed accepted figures and that no health hazard then existed. Notice was drawn, however, to tests needed for further evaluation of the presence of HCB (hexachlorobenzene) and dieldrin in the food supply. In 1973 a survey showed that levels of dieldrin and HCB residues had decreased and the intake of these pesticides in the diet was within accepted limits. In 1974 the survey showed only two occasions out of 24 when the accepted daily intake for dieldrin of 7 μg/day was surpassed. The accepted level for HCB of 0.04 mg/day was not exceeded in any case. In 1975 no sample of food studied exceeded the levels allowed for DDT, heptachlor and lindane. Two samples of pork chops and one of eggs exceeded the

maximum limit for dieldrin, and one sample of wholemeal bread exceeded the HCB limit. In 1977 the survey was widened to include nitrites, nitrates, nitrosamines and ethylenethiourea, a decomposition product of the ethylene *bis* dithiocarbamate pesticide group.

79-0789. Eschenbruch, R.; Dodanis, D.; Fisher, B. (Soil & Field Res. Organ., Hamilton, New Zealand) **The influence of fungicides on the zinc and manganese content of grape juice and on hydrogen sulphide formation during fermentation.** *Food Technol. N. Z.* 13(9): 21, 23; 1978. (21 references)

Vitis vinifera Palomino was sprayed against Downy Mildew and Anthracnose in 1974, 1975, and 1976 at biweekly intervals, 5 times for petal fall until ripeness. No sprays were applied during the 2 wk immediately proceeding harvest. Manganese content of 10 untreated Portuguese juices varied from 0.9 to 1.9 mg/l. In 1976 the manganese content in juice from grapes sprayed with maneb was 10.0 mg/l; in juice from grapes sprayed with zineb the Mn concentration was 0.9 mg/l; with mancozeb, 6.2 mg/l; and with thiram; 1.2 mg/l. The zinc concentrations in juices from those sprayed with maneb, zineb, mancozeb, and thiram, were 0.6, 5.1, 2.2, and 0.6 mg/l, respectively. Over the period of this study, formation of hydrogen sulfide during fermentation increased, especially in 1976, to its highest point of 17 μg/l. Harvesting after 2 wk following spray treatment with thiram yielded juices which had delayed fermentation reactions of about ten days.

79-0790. Kiril'chuk, P. P.; Ponomarenko, V. N.; Zakordonets, V. A.; Stadnichenko, A. M. (Author address not given) **Gigienicheskie voprosy v svyazi s primeneniem metilmerkaptofosa v khmelevodstve. [Hygienic questions on the use of methylmercaptophos in hop growing.]** *Gig. Sanit.* 43(10): 103-104; 1978. (5 references) (Russian)

The abatement of methylmercaptophos (demeton-*O*-methyl) levels in the air on hop plantations and on hop plants after spraying was studied. Methylmercaptophos was used at a rate of 1.8 or 5.6 kg/ha, using 800 l spray/ha. The concentrations measured in the air were 2.88 mg/m³ on the day of the application and 0.06 mg/m³ on the 8th day. No residues were found in the air on the 9th day. On the day of application, the concentration exceeded the maximum allowable concentration of 0.1 mg/m³ by five times even at 1.1 km distance. In hop plants, a residue level of 0.06 mg/kg was found 21 days after spraying, but no residue was found after 25 days. The findings indicate that there should be a safety distance (temporarily suggested at 1.1 km) between hop plantations and residential areas, and that work involving contact with hop plants should not be performed before the 12th day after treatment. Works not involving contact with the plants can be performed on the plantations not earlier than 7 days after treatment. The interval between the last spraying and harvesting should be at least 21 days.

79-0791. Takahashi, Y.; Morita, M.; Akiyama, K.; Mimura, S.; Yamagishi, T. (Tokyo Metrop. Inst. Hyg., Tokyo, Japan) **[Presence of herbicidal residues, 2,4,6-trichlorophenyl-4'-nitrophenyl ether (CNP) and 2,4-dichlorophenyl- 4'-nitrophenyl ether (NIP) in water system.]** *Jpn. J. Public Health (Nippon Koshu Eisei Zasshi)* 25(10): 546; 1978. (Japanese)

The content of 2,4,6-trinitrophenyl- 4'-nitrophenyl ether (CNP, chlornitrofen) in the raw water introduced into the water purifying plant of Tokyo Metropolis and in the purified water were non-detectable (ND)- 0.3 ppt and ND in September 1977, ND and ND in April 1978, and 48 and 60 ppt in June 1978. Those of 2,4-dichlorophenyl- 4'-nitrophenyl ether (NIP, nitrofen) were 0.2-1.2 ppt and ND in September 1977, ND-1.5 ppt and ND in April 1978, and 1.8 and 2.0 ppt in July 1978. These results seem to correlate with the season of herbicide application. Studies on sea water of Tokyo Bay showed a content of 1.8-7.9 ppt of CNP in September 1978. The method of detection and determination of CNP and NIP in water by extraction with hexane, then column-chromatography and gas chromatography was described. The recovery of CNP and NIP by this method was 80% on the average. [At the 37th Annual Meeting of the Japanese Society of Public Health.]

79-0792. Minakawa, O.; Ishii, S.; Konno, H. (Sch. Public Health, Fac. Med., Akita Univ., Akita, Japan) **[Analytical method of residue of molinate, a herbicide in paddy field, and actions of molinate to living bodies.]** *Jpn. J. Public Health (Nippon Koshu Eisei Zasshi)* 25(11): 645-651; 1978. (10 references) (Japanese)

Methods for identification and determination of molinate, *S*-ethyl- hexahydro-1 H-azepin-1-yl- carbothioate, in water and its formulation using gas chromatography and GC-MS were described. A case of human intoxication due to drinking of polluted water by applied molinate (0.006 ppm) in the neighboring paddy field, and a large scale fish intoxication in Hachiroogata resulting in anemia and death in 1975 and 1976 were reported. The highest concentration of molinate in the lake was 0.05 ppm. Experimental results of fish toxicity indicated that molinate induces acute anemia due to abnormal blood coagulation at a concentration higher than 0.04 ppm in water. However, surviving fish recovered after they were put into fresh water.

79-0793. Que Hee, S. S.; Paine, S. H.; Sutherland, R. G. (Dep. Environ. Health, Kettering Lab., Univ. Cincinnati, Cincinnati, OH 45267) **Photodecomposition of a formulated mixed butyl ester of 2,4-dichlorophenoxyacetic acid in aqueous and hexane solutions.** *J. Agric. Food Chem.* 27(1): 79-82; 1979. (11 references)

Aqueous and hexane solutions of a commercial chemically defined formulation containing mixed butyl esters of 2,4-dichlorophenoxyacetic acid (2,4-D) were irradiated by ultraviolet light of around 300- and 350-nm wavelengths, and the results were compared with those for hexane solutions of the pure *n*-butyl ester and for dark controls. Photodecomposition in all solvents was negligible at 350 nm (ca. 2%), but reductive dechlorination at the ortho position preferentially occurred at 300 nm independent of solvent or whether Pyrex

or quartz reactor cells were utilized. Thus, the (*p*-chlorophenoxy) acetic esters, which are still quite phytotoxic, were the major products, and these could pose a threat to nontarget plants because of their volatility. In the studies dealing with commercial emulsion concentrates, a complete mass balance with respect to 2,4-D was obtained by using ^{14}C acid labeled separately in the carboxyl, methylene, and ring (uniformly labeled) positions. The existence of micelles in aqueous solutions was postulated to explain the photoproducts formed in aqueous solution. No chlorinated *p*-dibenzodioxins were found. (Author abstract reprinted by permission of the American Chemical Society)

79-0794. Williams, I. H.; Brown, M. J. (Res. Stn., Agric. Canada, Vancouver, British Columbia V6T 1X2, Canada) **Persistence of permethrin and WL 43775 in soil.** *J. Agric. Food Chem.* 27(1): 130-132; 1979. (2 references)

Six soils, fortified with permethrin or WL 43775 at 1 mg/kg, were incubated for 16 wk at temperatures alternating between 20°C for 15 hr and 10°C for 9 hr. Initially and at 4-wk intervals soils were sampled and analyzed. In five of the soils degradation of both inseciticides was rapid, resulting in half-lives of approximately 3 wk for *cis*- and *trans*-permethrin and 7 wk for WL 43775. In the other soil very little degradation occurred: recovery after 16 wk was greater than 75% of *cis*-permethrin and WL 43775, slightly less for *trans* -permethrin. Sterilization of two of the soils in which degradation was rapid greatly reduced the rate, indicating that microbial degradation was the chief factor in loss of these insecticides. (Author abstract by permission of the American Chemical Society.)

79-0795. Golab, T.; Althaus, W. A.; Wooten, H. L. (Agric. Biochem., Lilly Res. Lab., Eli Lilly & Co., Greenfield, IN 46140) **Fate of [^{14}C]trifluralin in soil.** *J. Agric. Food Chem.* 27(1): 163-179; 1979. (18 references)

The degradation of trifluralin was investigated in field soil over a 3-yr period. A 2-mo laboratory investigation was also performed using field soil flooded with water. Twenty-eight transformation products were isolated and identified in these studies. None of the isolated transformation products exceeded 3% of the initially applied trifluralin. After 3 yr, less than 1.5% of the applied trifluralin could be detected in soil, 4% was distributed among numerous transformation products, and 38% remained as soil-bound residues. α,α,α-Trifluoro toluene-3,4,5-triamine, a degradation product of trifluralin, appeared to be a key compound in the formation of soil-bound residues. (Author abstract reprinted by permission of the American Chemical Society.)

79-0796. Chaudry, M. M.; Nelson, A. I.; Perkins, E. G. (Dep. Food Sci. Univ. Illinois, Urbana, Il 61801) **Distribution of chlorinated pesticides in soybeans, soybean oil, and its by-products during processing.** *J. Am. Oil Chem. Soc.* 55(12): 851-853; 1978. (12 references)

Residues of α-BHC, lindane, β-BHC, heptachlor, aldrin, heptachlor epoxide, *p,p'*-DDE, dieldrin, *o,p'*-DDD (TDE), endrin, *o,p'*-DDT, *p,p'*-DDD, and *p,p'*-DDT were measured in various fractions of soybeans. All soybean fractions and oils extracted therefrom contained varying concentlrations of the residues with the exception of *p,p'*-DDE and *o,p'*-DDD. In general the residues were found in cotyledons, whole soybeans, hulls and hypocotyls and fines, in increasing order. The total polychlorinated pesticides were found to be 80.9, 108,4, 144.2, and 326.2 ppb in cotyledons, whole beans, hulls, and hypocotyls, and fines, respectively. Total concentrations of chlorinated residues were 387.7, 530.6, 1330.9, and 4284.7 ppb in the oils extracted from cotyledons, whole beans, hypocotyls and fines, and hulls, respectively.

79-0797. Yurawecz, M. P. (Div. Chem. Technol., US FDA, Washington, DC 20204) **Gas-liquid chromatographic and mass spectrometric identification of chlorinated trifluorotoluene residues in Niagara River fish.** *J. Assoc. Off. Anal. Chem.* 62(1): 36-40, 1979; 1979. (3 references)

Several unknown halogenated compounds were detected in Niagara River fish using a method similar to the AOAC multiresidue method for chlorinated pesticides in high-moisture foods. From gas-liquid chromatographic-mass spectrometric (GLC/MS) data and GLC retention times on 3 columns, 7 of the compounds were identified as 4-chloro-α,α,α-trifluorotoluene (0.17-2.0 ppm), 2-chloro-α,α,α-trifluorotoluene (0.02-0.17 ppm), 2,3-dichloro-α,α,α-trifluorotoleuene (trace-0.005 ppm), 2,6-dichlorotoluene (not quantitated), and 2,4,5-trichlorotoluene (0.31 ppm was found in the only sample quantitated). Other isomers of tri- and tetrachloro-α,α,α-trifluorotoluene and di-, tri-, and tetrachlorotoluene were also present in these samples. Recoveries of the specific chlorinated trifluorotoluenes identified in these samples ranged from 86 to 108%. (Author abstract by permission)

79-0798. Deuel, L. E., Jr.; Price, J. D.; Turner, F. T.; Brown, K. W. (Dep. Soil & Crop Sci., Texas A&M Univ., College Station, TX 77843) **Persistence of carbofuran and its metabolites, 3-keto and 3-hydroxy carbofuran, under flooded rice culture.** *J. Environ. Qual.* 8(1): 23-26; 1979. (8 references)

Pesticides are essential for the economical production of rice in the Gulf Coast region of Texas, since weeds and insects could severely damage the crop if uncontrolled. However, water quality of surface impoundments and estuaries interspersed in close geographic proximty to the rice belt could be adversely affected by pesticide loading via irrigation return flow. Field experiments were conducted under flooded rice (*Oryza sativa* L.) culture to evaluate residual levels of carbofuran (2,3-dihydro-2,2-dimethyl -7- benzofuranyl-*N* -methyl carbamate), 3-keto carbofuran (2,3-dihydro-2,2-dimethyl-3-keto -7- benzofuranyl-*N*-methyl carbamate), and 3-hydroxy carbofuran (2,3-dihydro-2,2-dimethyl-3- hydroxy-7- benzofuranyl-*N*-methyl carbamate). Treatments consisted of two rates of carbofuran (0.56 and 3.35 kg/ha) superimposed on two irrigation management schemes (intermittent and continous flow). Results of the 3-yr field and

laboratory study suggested that carbofuran was dissipated from the plot water via an adsorptive mechanism. Carbofuran applied at the recommended rate was generally dissipated within 96 hr following its infusion into the plot water. The evaluation of carbofuran persistence was complicated by surges in plot water values corresponding to rainfall events, although statistically significant quantities remained for longer periods of time in those plots which had received the excessive application rate. Irrigation management was not a significant source of variation once values were normalized to account for the variable plot water depths. Neither 3-keto nor 3-hydroxy carbofuran were detected in excess of 0.001 kg/ha at the recommended application rate. (Author abstract by permission)

79-0799. Fryer, J. D.; Smith, P. D.; Ludwig, J. W. (Agric. Res. Counc., Weed Res. Organ., Yarnton, Oxford OX5 1PF, England) **Long-term persistence of picloram in a sandy loam soil.** *J. Environ. Qual.* 8(1): 83-86; 1979. (13 references)

Picloram (4-amino-3,5,6-trichloropicolinic acid) was applied to a ryegrass (*Lolium perenne* L. cv S23) sward at 0.05, 0.28, and 1.68 kg ai (active ingredient)/ha in June 1967 and again in August of 1969 and 1970. Small amounts of residue were found in soil samples 1 yr after application of the low and medium doses. On the highest dose plots, 5 to 6% of the amount applied was usually recovered 1 yr after spraying. Following the final application this residue degraded slowly over the following 3 yr. Analyses of the final samples (taken 222 wk after spraying) indicated that the residue had declined to about 0.5% of the total amount applied. In stratified soil samples, residues were found to the maximum sample depth of 90 cm 1 yr after the initial application, but 69 wk after the final application no residue was found below 30 cm. Crops grown across all plots in 1974 did not differ in yield. However, on the plots that had received the highest dose, leaf abnormalities were noted in beans and potatoes and color differences were observed in kale. (Author abstract by permission)

79-0800. Siddaramappa, R.; Tirol, A. C.; Seiber, J. N.; Heinrichs, E. A.; Watanabe, I. (Internat. Rice Res. Inst., Los Banos, Languna, Philippines.) **The degradation of carbofuran in paddy water and flooded soil of untreated and retreated rice fields.** *J. Environ. Sci. Health B* 13(4): 369-380; 1978. (11 references)

Degradation of technically pure carbofuran in paddy water was studied by incubating 5 ml aliquots of paddy water and 5 ml of about 20 ppm of carbofuran in distilled water in a test tube. Carbofuran concentration decreased rapidly in about 5 days irrespective of paddy water from the carbofuran treated or untreated plot. Previous carbofuran application therefore did not influence present rate of carbofuran phenol. Autoclaving paddy water did not affect the degradation of carbofuran but the degradation of carbofuran phenol was inhibited. Light had only an indirect effect on the degradation of carbofuran in paddy water. Enhanced degradation appeared under light after three days in paddy water of untreated plots which was due to algal growth and a corresponding increase in the pH of the medium from 8.2 to 9.0.

79-0801. Yamagishi, T.; Akiyama, K.; Morita, M.; Takahashi, R.; Murakama, H. (Tokyo Metrop. Res. Lab. Public Health, Shinjuku-ku, Tokyo, Japan) **Isolation and identification of 1,3,5-trichloro- 2-(4-nitrophenoxy) benzene (CNP) in shellfish.** *J. Environ. Sci. Health B* 13(4): 417-424; 1978. (6 references)

Shellfish were collected at the seashore near Chiba Central Port along Tokyo Bay, on July 4, 1977. An ECD gas chromatogram of the mussel sample taken from these shellfish followed by UV and IR identification indicated the presence of CNP, 1,3,5-trichloro- 2-(4-nitrophenoxy) benzene, a widely used herbicide in Japan, applied mainly to rice plantations during the early summer. The approximate level of CNP in mussels examined in this study was 1.04 ppm on a wet basis for shelled samples.

79-0802. Norstrom, R. J.; Hallett, D. J.; Sonstegard, R. A. (Wildl. Toxicol. Div., Can. Wildl. Serv., Dep. Fish. & Environ., Ottawa, K1A OE7, Canada) **Coho salmon (*Oncorhynchus kisutch*) and herring gulls (*Larus argentatus*) as indicators of organochlorine contamination in Lake Ontario.** *J. Fish. Res. Board Can.* 35(11): 1401-1409; 1978. (24 references)

Coho salmon (*Oncorhynchus kisutch*) and herring gulls (*Larus argentatus*) in the Great Lakes depend to a large extent on alewives (*Alosa pseudoharengus*) and smelt (*Osmerus mordax*) for their food. All of these species range widely in the lakes, and therefore provide an integrated measure of levels of organochlorine contaminants in the lakes. Organochlorine residues were determined in herring gull eggs from four eastern Lake Ontario colonies, coho salmon from western Lake Ontario, and pooled alewife and smelt from the stomach contents of the salmon. The mean apparent bioconcentration factor was 2.9 $\pm$ 0.7 for accumulation of PCB, DDE, mirex, photomirex, HCB (hexachlorobenzene), dieldrin, and DDD (TDE) in coho salmon muscle form alewives and smelt. The salmon had a mean weight of 2.4 kg and a mean lipid content of 8.2%. The bioconcentration factor was 50 $\pm$ 10 for accumulation of PCB with more than five chlorines, DDE, mirex, and photomirex in herring gull eggs. PCB with fewer than six chlorines, HCB, dieldrin, and DDD were concentrated to a lesser extent in herring gull eggs. Assuming an apparent bioconcentration factor from water of 5×10^5 for accumulation of PCBs, DDE, mirex, and photomirex in smelt and alewives, the corresponding values in coho salmon and herring gull eggs were 1.5×10^6 and 2.5×10^7. (Author abstract by permission)

79-0803. Gasaway, J. M. (LEXAN Prod. Dep., Gen. Electr. Co., Pittsfield, MA 01201) **Significance of abuse chemical contamintion of returnable dairy containers: pesticide storage and detector evaluation.** *J. Food Prot.* 41(11): 851-862; 1978. (7 references)

Eighty-five pesticide products were tested for possible contamination to dairy containers in which they were stored. Storage conditions were similar to those which would be encountered in normal households. Glass containers were not contaminated by the chemicals. HDPE resin containers were not contaminated after three days storage times, but there was one instance of contamination in a 10-day storage test. LEXAN resin containers were contaminated in 26 of the tests after 3 days of storage, and after 10 days, 28 of the chemicals were judged incompatible with the containers. Part of the incompatibility in these pesticide products was due to the solvent carriers. The containers were also tested using a "snifter" which was designed to puncture containers showing signs of contamination. It was determined that the incompatibility of stored pesticides with LEXAN resin was more effective in detecting and discarding misused containers than was the "snifter" detection device used for polyethylene plastic containers.

79-0804. Gasaway, J. M. (LEXAN Prod. Dep., Gen. Electr. Co., Pittsfield, MA 01201) **Significance of abuse chemical contamination of returnable dairy containers: sensory and extraction studies.** *J. Food Prot.* 41(11): 863-877; 1978. (64 references)

Sensory testing of washed returnable dairy containers manufactured from LEXAN resin, HDPE plastic, and glass was evaluated for the detection of pesticides which had been stored in the containers. The contaminant detecting device used was found to be less sensitive to finding contaminated containers than was the sensory testing device which relied on the detecting of off-odors. Each type of container demonstrated off-odors after they had stored pesticides and were then washed. When milk was then placed into the washed containers, 6 out of 85 LEXAN containers were found to contain milk contaminated by the residues of pesticides remaining. The same was true for 22 out of 85 polyethylene plastic containers.

79-0805. Idelobitch, E. (Tahal, Water Plan. Israel Ltd., Tel Aviv., Israel) **Wastewater reuse by biological-chemical treatment.** *J. Water Pollut. Control Fed.* 50(12): 2723-2740; 1978. (33 references)

The various approaches to municipal wastewater reuse and treatment technology were examined in relation to the Dan Region Project (Israel) Stage-I. Treatment processes within the plan were examined, based on results from a pilot plant operation. Tertiary effluent, treated by biological methods (oxidation ponds) and followed by chemical treatment (high lime-magnesium process and detention in polishing ponds) was analyzed for six pesticides: lindane, endrin, toxaphene, methoxychlor, 2,4-D and 2,4,5-TP. These compounds were present in concentrations well below the EPA limits for public water supply. It was found that lindane and aldrin were effectively removed by the high lime-magnesium treatment and polishing ponds. The results of analyses for six carcinogenic polynuclear aromatic hydrocarbons (fluoranthene, 3,4- and 11,12-benzfluoranthene, 3,4-benzpyrene, 1,12-benzperylene and indeno(1,2,3-cd)pyrene were also found well below the legal limits in the tertiary effluent.

79-0806. Timofeeva, O. A.; Shvartsman, G. A.; Pyshnaya, E. B. (Mold. Sci. Res. Inst. Food Ind., Kishinev, USSR) **Vliyanie khraneniya na ostatki pestitsidov v konservakh. [Effects of storage on pesticide residues in canned goods.]** *Konservn. Ovoshchesush. Promst.* (9): 10-12; 1978. (Russian)

The effects of processing (washing, pressing, blanching and sterilization) and storage on the residue levels of hexachlorobutadiene, lindane, carbophos (malathion), phthaltan (folpet), and anthio (formothion) were studied in canned stewed plums and must. The raw fruits were contaminated with the pesticides by being dipped into their suspensions or emulsions for 1-4 min. The hexachlorobutadiene level in must showed practically no changes in sealed cans in 2 yr, but it dropped to zero in a few days in non-sealed containers. There were no changes in the lindane levels in canned stewed plums, and a decrease was seen after 27 mo in some samples only. THe phthalan residue in must dropped to zero in 4 yr. The carbophos levels in stewed plums and must declined only slightly in 3 yr; the reduction was 39.7-75.9% after the first yr, and 68.3-90.5% after the third yr in stewed plums. In must, the carbophos level dropped 21.5-71.2% after the first yr, and 41-85.9% after the third yr. Anthio was more or less completely decomposed during the sterilization, and no residues were found in stewed plums and must after 2 yr. Phosphamide (dimethoate), formed from anthio, was, however, found in the samples in concentrations of 0.434-2.1 mg/kg immediately after canning, and 0.238-1.473 mg/kg after 2 yr, corresponding to a decrease of 9.3-73.2% in stewed plums and 9.8-74.5% in must.

79-0807. Sugaya, H.; Hayashi, S.; Meguro, Y.; Watabe, K.; Suzuki, Y.; Minagawa, N.; Sasaki, S. (Inst. Rural Med., Hiraga Gen. Hosp., Hiraga, Akita, Japan) **[Amount of organochlorine pesticide residues in human body.]** *Nippon Noson Igakkai Zasshi (Jpn. J. Rural Med.)* 27(4): 747-750; 1978. (11 references) (Japanese)

Results of determinations of organochlorine pesticide residues in mother's milk, adipose tissue obtained from surgery and biopsy, and internal organs obtained from biopsy from 1973 to 1976, are reported. The mean value and standard deviation of β-BHC was 0.526 and 0.062 ppm in the kidney, 0.286 and 0.043 ppm in the liver, 0.111 and 0.016 ppm in the spleen, and 0.091 and 0.016 ppm in the brain. The levels of *p,p'*-DDE were 0.565 and 0.079 ppm in the kidney, 0.263 and 0.039 ppm in the liver, 0.149 and 0.015 ppm in the spleen and 0.097 and 0.016 ppm in the brain. The amount of β-BHC, *p,p'*-DDE, *p,p'*-DDT, and dieldrin in mother's milk determined in 1971 were 3.204, 2.482, 0.827, and 0.276 ppm, respectively, as compared to 1976 values of 1.603, 2,248, 0.261, and 0.130 ppm, respectively. Residues levels of β-BHC, *p,p'*-DDE, *p,p'*-DDT, and dieldrin in human adipose tissue in 1971 were 2.961, 1.268, 0.600, and 0.216 ppm, respectively, as compared to 1976 values of 1.695, 1.863, 0.441, and 0.204 ppm, respectively. No large difference was seen in

pesticide residues in mother's milk between farmer and non-farmer, and between primiparous and multiparous mothers. Also there was no significant difference found in pesticide residues in human adipose tissues from patients with malignant tumor and patients with other disease.

79-0808. Kawanishi, A.; Asanuma, N.; Suzuki, A.; Yanagisawa, T.; Miyazawa, S.; Kurosawa, K.; Ide, H.; Okamura, G. (Jap. Inst. Rural Med., Saku Gen. Hosp., Usuda, Nagano, Japan.) **[Studies on human-residues of organochlorine pesticides.]** *Nippon Noson Igakkai Zasshi (Jpn. J. Rural Med.)* 27(4): 751-761; 1978. (4 references) (Japanese)

Results of determinations of organochlorine pesticide residues in human fat collected from January - March, 1977 were reported. Despite the 7 yr lapse since the ban on organochlorine pesticides, residues of total DDT of 6.384 ppm (s.d. 8.860 ppm), and of dieldrin of 0.204 ppm (s.d. 0.229 ppm) were found. A significant correlation was found between the amount of residue and age, but no significant correlation due to sex was noted. Mean values for pesticide residues in 16 patients with stomach cancer were slightly higher than those for 60 patients of other disease. The mean values of all the 278 data obtained in the past 4 yr were for BHC 2.880 ppm (s.d. 2.744 ppm), for DDT 9.151 ppm (s.d. 9.709 ppm), and for dieldrin, 0.147 ppm (s.d. 0.171 ppm). Significantly larger amounts of total DDT were found in patients with liver disease and in patients with cancers of digestive organs than in patients with other diseases.

79-0809. Nakamura, T.; Suzuki, A.; Asanuma, N.; Kurosawa, K. (Jap. Inst. Rural Med., Saku Gen. Hosp., Usuda, Nagano, Japan) **[Analytical investigation of residual mercury in human hair.]** *Nippon Noson Igakkai Zasshi (Jpn. J. Rural Med.)* 27(4): 762-764; 1978. (9 references) (Japanese)

Amounts of mercury in 120 samples of human hair were determined over a period of 4 yr beginning in 1973. The age range of the persons tested was from the thirties to fifties. The mean values for mercury in hair of male non-farmers were 6.2, 6.1, 6.9 and 6.1 ppm, in 1973, 1974, 1975 and 1976, respectively, while in farmers they were 4.1, 4.0, 4.0 and 4.2 ppm, respectively. Mercury levels in hair of female non-farmers in 1973, 1974, 1975 and 1976 were 3.9, 3.5, 3.7 and 2.6 ppm, respectively, while those in female farmers were 2.3, 1.9, 1.7 and 1.7 ppm, respectively. The amount of methyl mercury in total mercury was about 36 to 69% showing no prevalence in any group. In two subjects with long hair, the effect of diet on the mercury content of the hair was found to be significant. Overall, the content of mercury found in hair was found to be decreased since the ban on mercury containing - pesticides, however, the average mercury content in Japanese hair is larger than that in foreigners' hair.

79-0810. Anonymous **Pollution des plantes medicinales par les insecticides organochlores. [Pollution of medicinal plants by organochlorine insecticides.]** *Pollut. Atmos.* 20(79): 206; 1978. (French)

A dissertation on the pollution of medicinal plants with organochlorine pesticides is reviewed. Samples from 11 plant species, collected during the 1974-1977 period, were analyzed. Lindane was identified as the major pollutant. Some samples contained *p,p'*-DDT, but especially prevalent were α-BHC, aldrin, and heptachlor. The samples collected in 1977 contained lindane only; it was detected in 50% of all samples. The lindane residue averaged 0.15 mg/kg of dry weight in 1977, the *p,p'*-DDT level, 0.037 mg/kg in 1975. Peppermint and camomile were least polluted.

79-0811. Nishio, K. (Dep. Countermeas. Environ. Pollut., All Japan Fed. Coop. Assoc. Fish., Tokyo, Japan) **[Problems of agricultural chemicals (pesticides) seen from the coastal fishery.]** *Seitai No Kagaku (Environ. Ecol. Chem.)* 1(3): 131-148; 1978. (10 references) (Japanese)

The problems of pesticides in the Japanese coastal fishery are explained concentrating on the deformation of coastal fishes. Between 1970 - 1975 curled vertebrate in cultivated young yellowtails occurred. It has been elucidated that BHC, methyl parathion, diazinon, EPN, malathion, salithion, thiophanate-methyl, leptophos, phenthoate (dimethoate) and *o*-sec-butylphenyl methylcarbamate induce the symptom of curled vertebrate in several kinds of coastal and oceanic fishes. Next, several cases of large scale death of coastal fishes took place in 1976 and 1977. These kills were attributed to diazinon applied to paddy fields. Death of cultivated prawns due to fenitrothion application to pine forests, and death of carp due to molinate applied as an herbicide in paddy fields are the recent severe problems concerning pesticide application. Several specific incidents are reported by tables, and acute toxicities of representative pesticide to representative species of fish and shellfish are given. The results of a survey of residual pesticides in water systems are also given. The necessity of adopting sub-acute data of fish toxicity, as well as the re-examination of the safety of pesticide are emphasized.

79-0812. Singhal, J. P.; Bansal, V. (Chem. Lab., Fac. Eng. & Technol., Aligarh Muslim Univ., Aligarh, India) **Studies of the mobility of pesticides by soil thin layer chromatography.** *Soil Sci.* 126(6): 360-363; 1978. (15 references)

An Aligarh soil slurry was prepared with distilled water, and placed on glass plates (20 x 20 cm) to a 0.5 mm thickness. Solutions of 10% of phosphamidon, malathion, dichlorvos and 4% ethanolic solution of ziram and zineb were spotted on the plates. The plates were developed in closed chambers using distilled water as the developing solvent. Silver nitrate in an aqueous acetate solution was used as the detection reagent. Rf values were determined, showing ziram and zineb with the highest values. The effects of pH changes were examined, showing acidic or alkaline conditions giving higher Rf values. There was no correlation between Rf values and particle size, while organic matter tended to increase Rf values. Cationic and nonionic surfactants ($\leq$ 0.02%) tended to increase Rf values, while anionic surfactants tended to decrease values.

79-0813. Peng, S. Y. (Taiwan Sugar Res. Inst., Taipei, Taiwan) **On the persistence of soil-applied herbicides.** *Taiwan Sugar* 25(5): 168-171; 1978. (11 references)

Herbicides used in soil application for preemergence control of weeds have been widely adopted in the sugarcane industry. The effect of the herbicide is dependent on such factors as herbicide solubility, soil conditions and biological and chemical degradation. To test the effect of residual herbicides on rotational croppings and intercroppings, soybeans, mung beans, groundnuts, corn, sweet potatoes and cucumbers were planted in soil treated with ametryne, atrazine, napropamide, diuron, norea, metribuzin, 2,3,6-TBA, TCA and trifluralin. The effects of the herbicides were dependent on application rate and the subsequent crop planted, although none of the herbicides affected the sugarcane. Herbicides applied in dosages of 1.6 to 3.2 kg/ha were not toxic to supplementary crops 12 to 18 mo after application. Breaking of field ridges helped decrease the residual effects of the herbicide. Indications show subsequent treatments may be done with lower dosages on the herbicides to attain the same level of effectiveness.

79-0814. Kamata, K.; Yamazoe, R.; Harada, H. (Sect. Microanal., Tokyo Metrop. Res. Lab. Public Health, Tokyo, Japan) **[Survey of chlorinated pesticides in cigarettes.]** *Tokyo Toritsu Eisei Kenkyusho Nempo (Ann. Rep. Tokyo Metrop. Res. Lab. Public Health)* 28(1): 111-115; 1977. (11 references) (Japanese)

Specimens consisting of 22 brands of domestic cigarettes, 30 brands of imported cigarettes and 3 brands of cigars were analyzed by means of gas chromatography for residue levels of organochlorine pesticides. Each brand consisted of 20 items/pack and so the values of the analytical determination were expressed as per pack. Residual amounts of DDT and its derivatives were reduced 10 times when compared to the residual amounts of 6 yr ago. Residues of BHC and its derivative were reduced little. Mean values of residual amounts of γ-BHC were 0.44 μg in domestic brands (mean value of total BHC of 0.90 μg) and 0.51 μg in imported brands (mean value of total BHC of 1.11 μg). Residual amounts of *p,p'*-DDT were on the average 6.79 μg in domestic brands and 9.27 μg in imported brands. Total DDT in domestic brands was 8.95, and in imported brands, 20.48 μg. Higher amounts of *p,p'*-DDT and total DDT were found in cigars, and were, on the average 198.2 and 278.8 μg, respectively. Amounts of residual γ-BHC and total BHC were on the order of 0.41 and 0.81 μg, respectively.

79-0815. Oshida, H.; Tochimoto, H.; Sasano, H.; Nakamura, H.; Tomonari, H.; Kikuchi, Y.; Ikejima, N. (Sect. Water Qual., Tokyo Metrop. Res. Lab. Public Health, Tokyo, Japan) **[Residual amount and degradation of dichlorvos in water.]** *Tokyo Toritsu Eisei Kenkyusho Nempo (Annu. Rep. Tokyo Metrop. Res. Lab., Public Health)* 29(1): 362-366; 1978. (2 references) (Japanese)

Studies on the fate of dichlorvos in streams and in water treatment plants are presented. Dichlorvos (565 and 141 g, 50%EC) was applied to a *Wasabi japonica* paddy field. Measurements taken at a point 2 km downstream from the field indicated 24% of the dichlorvos was still present. Aeration of dichlorvos contaminated water reduced residual amounts of the pesticide by 6-16%. Although chlorine treatments of the water were somewhat effective, filtration through sand was the most effective method of removing dichlorvos from water. Microbial populations in the sand were suggested to be an important aspect of this degradation. Removal success by sand filtration was 100%.

79-0816. Backman, L.; Kolmodin-Hedman, B. (Dep. Surg., Serafimerlasarettet, S-11283 Stockholm, Sweden) **Concentration of DDT and DDE in plasma and subcutaneous adipose tissue before and after intestinal bypass operation for treatment of obesity.** *Toxicol. Appl. Pharmacol.* 46(3): 663-669; 1978. (22 references)

DDT and its principal metabolite, DDE, are stored mainly in body fat. In spite of a general prohibition in household use in 1970, the general population in Sweden is still exposed to these pesticides in the diet. The aim of this study was to examine whether weight loss is followed by increased concentrations of the pesticides in adipose tissue and plasma and whether increased concentrations could possibly explain some unusual neurological symptoms observed in some patients after a shunt operation. Eight subjects were examined before and 1 yr after jejuno-ileostomy. The mean weight loss was 46.9 ± 2.8 kg. The concentration of *p,p'*-DDE in plasma increased significantly from 5.1 ± 0.9 to 8.2 ± 1.3 ng/ml during the weight loss. This concentration is still well below the concentration in a control group of nonexposed office personnel whose mean concentration is 19 ± 4.0 ng/ml. In adipose tissue the mean concentrations of *p,p'*-DDT and *p,p'*-DDE increased from 390 ± 65 to 526 ± 107 ng/g and 863 ± 136 to 1341 ± 194 ng/g, respectively. The ratio of DDE: DDT increased in all but one subject, indicating an increased metabolism of DDT after the operation. The calculated total body content of DDT and DDE decreased in all but two patients after the bypass operation due to increased metabolism and excretion. The risk of DDT intoxication following an intestinal bypass operation appears to be small.

79-0817. Fukushima Prefect. Off., Fukushima, Japan **[Environmental pollution due to pesticides for agricultural use.]** *Whitepaper on Environmental Pollution 1978, Fukushima Prefecture (Kogai Hakusho Showa 53 Nendo)* pp. 288-299; 1979. (Japanese)

Several countermeasures for preventing environmental pollution due to pesticides for agricultural use, which have taken in the 1973 fiscal year were described. Results of determinations of pesticide residues in foods were reported. Total BHC residues ranged from 0.002 - 0.003 ppm and total DDT residues were 0.001 ppm in five specimens of salted Japanese radish. In salted cucumber residues of 0.001 - 0.003 ppm of total BHC, ND- 0.003 ppm of total DDT, and 0.005 ppm of dieldrin were found. In Japanese pear, diazinon residues

ranged from 0.001 - 0.002 ppm. In samples of apples, pesticide levels were 0.04 - 0.001 ppm for diazinon, and 0.03 - 0.002 ppm for fenitrothion. Only two exceptionally high (0.01 and 0.009 ppm) levels of dieldrin residues were found in six specimens of cucumber grown in Fukshima Prefecture.

79-0818. Thielemann, H.; Grahneis, H. (Hyg. Inst. Martin-Luther-Univ., DDR-402 Halle, DDR) **Experimentelle Untersuchungen zur Frage der Kontamination von Tee, Gewuerzen, Frucht- und Heilsaften mit Pflanzenschutzmitteln (DDT). [Experimental study on the contamination of tea, spices and fruit and medicinal juices with plant-protecting agents (DDT).]** *Ihre Grenzgeb.* 24(9): 693-694; 1978. (German)

All commercially available brands of teas, spices and fruit and medicinal juices in East Germany in 1966 and 1967 were investigated for DDT residues by TLC. DDT residues were found in 14 out of 52 tea samples, ranging from 0.1 to 3 ppm. Residues were found in 3 out of 30 spice samples, ranging from 0.2 to 5 ppm. No residues were found in the 48 juice samples analyzed.

79-0819. Nesterin, M. F. (Dep. Food Hyg. Inst. Nutr. USSR Acad. Med. Sci., Moscow, USSR) **Aktual'nye voprosy toksikologii pishchi. [Current questions in food toxicology.]** *Zh. Vses. Khim. O-va* 23(4): 372-378; 1978. (58 references) (Russian)

Results of comprehensive analyses of food for residues of pesticides, heavy metals, hormones, nitrosamines and mycotoxins are reviewed. DDT was found in 5.9-90.0% of food samples collected in different areas of the USSR; BHC was found in 20.2-76.5%. The average daily intake for DDT is 0.005-0.076 mg/kg of food compared to an ADI of 0.005 mg/kg of body weight as recommended by FAO/WHO. BHC was found in 100% of all human brain, liver and adipose tissues analyzed, and in 91% of the kidney tissues. The levels were 17.4 μg/kg in the brain, 24.3 μg/kg in the liver, 12.5 μg/kg in the kidney, and 939.4 μg/kg in the fatty tissues. Human milk was found to contain about 0.1 mg of BHC and 0.16 mg of DDT per liter.

See also 79-0841 *and* 79-0892.

79-0820. Dasta, J. F. (Div. Pharm. Pract., Coll. Pharm., Ohio State Univ., Columbus, OH 43210) **Paraquat poisoning: a review.** *Am. J. Hosp. Pharm.* 35(11): 1368-1372; 1978. (59 references)

A review is presented in which the effects of poisoning by paraquat are discussed. A brief history of development and use of this compound was presented. The discovery of paraquat contamination of marijuana has generated much interest in the toxicity of this herbicide. Poisoning has occurred by oral ingestion, topical application, or inhalation. Severe poisoning has not occurred from smoking contaminated marijuana, but heavy coughing has resulted. Ingestion of 30 mg/kg has caused liver and kidney damage and heart failure. Respiratory distress, kidney dysfunction, and jaundice result from doses of 4 mg/kg. Forced diuresis, gut lavage, and absorbents like Fuller's earth or activated charcoal can be used to remove the poison from the digestive tract. The material must be removed immediately to prevent systemic toxicity or death.

79-0821. Dearden, L. C.; Fairshter, R. D.; McRae, D. M.; Smith, W. R.; Glauser, F. L.; Wilson, A. F. (Dep. Anat., Coll. Med., Univ. California, Irvine, CA 92717) **Pulmonary ultrastructure of the late aspects of human paraquat poisoning.** *Am. J. Pathol.* 93(3): 667-680; 1978. (32 references)

A description of ultrastructural pulmonary changes following paraquat poisoning in a 16-yr-old is presented. Electron micrograph studies were carried out on lung tissue (biopsy specimen) obtained 22 days after paraquat ingestion. Alveoli were reduced in number and were filled with plasma-like fluid containing erythrocytes, macrophages, leukocytes, fibroblast-like cells, platelets, and fibrin. Interstitial areas were found to contain proteinaceous plasma-like material, along with collagen, fibrin, platelets, mature fibroblasts, plasma cells, many leukocytes, numerous erythrocytes, and capillaries. No discernible alveolar septums were present.

79-0822. Dubrisay, J.; Fages, J. (Union Caisses Cent. Mutualite Agric., F-75380 Paris, France) **La pathologie professionnelle dans les activites agricoles. Essai d'approche statistique. II. - Les maladies d'origine professionnelle. [Occupational pathology in agricultural activities. Attempts of a statistical approach. II. Occupational diseases.]** *Arch. Mal. Prof. Med. Trav. Secur. Soc.* 39(7/8): 459-468; 1978. (French)

Statistical data are presented on 3,276 occupational diseases recorded in farm workers over a 3 yr period in France. The poisonings reported were due to the handling or application of various chemical substances, including pesticides, such as arsenic, mercury, nitrophenol derivatives, organophosphorus pesticides, methyl bromide, pentachlorophenol, aryloxyacid derivatives, quaternary ammonium derivatives, and thiocarbamates. Asthmatiform syndrome was reported in 23 cases; fungicides were identified as allergens in some of these cases.

79-0823. Anonymous **Cholestyramine effective against Kepone.** *BioScience* 28(4): 292; 1978.

In a double-blind study of 22 workers from the Hopewell, Virginia,plant where exposure to Kepone (chlordecone) had been a serious problem, treatment with cholestryramine accelerated the elimination of chlordecone from the blood and increased the fecal excretion of the pesticide seven times. The drug binds chlordecone in the intestine, thereby preventing its reabsorption into the bloodstream. Only 3 of 11 severely impaired workers remained so after treatment.

79-0824. Arena, J. M. (Dep. Pediatr., Med. Cent., Duke Univ.,Durham, NC) **The treatment of poisoning.** *CIBA Clin. Symp.* 30(2): 3-47; 1978.

A detailed description of poisonous substances and methods for treatment of poisoning is presented. Cleaning agents, household drugs, cosmetics, poisonous plants, and poisonous fumes are among the substances covered. Sources of mercury poisoning (antiseptics containing organic mercury, mercurial diuretics, ingestion of mercury bichloride) and of methyl mercury poisoning (contaminated fish and meat from animals fed contaminated grain) are presented, along with symptoms and treatment. Symptoms and treatments for poisoning by chlorinated hydrocarbon insecticides, organic phosphate insecticides, botanic insecticides, and rodenticides are also discussed.

79-0825. Benowitz, N. L.; Byrd, R.; Schambelan, M.; Rosenberg, J.; Roizen, M. (Clin. Pharmacol. Unit., San Franciso Gen. Hosp., San Francisco, CA) **Rodenticide induced orthostatic hypotension and its successful management with dihydroergotamine.** *Clin. Res.* 27(1): 73A; 1979.

A case study is presented in which a 31-yr-old male suffered from orthostatic hypotension due to ingestion of the rodenticide *N*-3- pyridyl methyl *N'-p*-nitro phenyl urea (Vacor). Blood pressure dropped 40% with an increase in heart rate of 45% after a 20° tilt. Administration of 0.5 mg im dihydroergotamine (DHE) arrested the symptoms. DHE was useful when indirect sympathomimetric drugs failed to alleviate the symptoms.

79-0826. Malten, K. E. (Sect. Occup. Dermatol., Nijmegen, The Netherlands) **Therapeutics for pets as neglected causes of contact dermatitis in housewives.** *Contact Dermatitis* 4(5): 296-300; 1978.

Two case studies are presented in which patients developed contact dermatitis from medicine (containing pesticide) they were using to treat their pets. To facilitate tracing causes for dermatitis, an extensive list of compounds found in pet medications is presented.

79-0827. Plestina, R.; Piukovic-Plestina, M. (Inst. Med. Res. & Occup. Health, Zagreb, Yugoslavia) **Effect of anticholinesterase pesticides on the eye and on vision.** *Crit. Rev. Toxicol.* 6(1): 1-23; 1978. (179 references)

A literature review of the effects of anticholinesterase-type pesticides on the human eye and vision is presented.

Details of exposure were minimal, generally discussed in terms of the compound in question and the extent of exposure. Pesticide exposure has led to diminished visual acuity, myopia, cataract, reduced vision, astigmatism, disturbed smooth pursuit motion, damaged retina, aberration in intracellular pressure, conjunctivitis, glaucoma, and photophobia. The subjects covered in the review include children (involved in poisonings), farmers and agriculture workers that handle pesticides, and pesticide applicators. A study by the author entailed observations on pesticide workers handling compounds for over five years. Two groups were included: a group exposed under poor working conditions with high overtime records; and a group exposed under good working conditions. The results showed the former group had low blood AChE activity, correlated to the extent of overtime worked. The latter group demonstrated much milder effects.

79-0828. Rappe, C. (Dep. Org. Chem., Univ. Umea, Umea, Sweden) **Decontamination of products formed during the industrial preparation of 2,4,5-trichlorophenol.** In: *Dioxin: Toxicological and Chemical Aspects.* Cattabeni, F., Cavallaro, A., Galli, G., eds., (Spectrum Publ. Inc.: NY) Chapter 17: 179-183; 1978. (3 references)

For the proper evaluation of a possible decontamination method it is necessary to know the levels of all potential precursors of TCDD. During the manufacture of 2,4,5-trichlorophenol the formation of TCDD is an unwanted side reaction. Several schemes of TCDD formation are possible, three of which are discussed.

79-0829. Wong, A. S.; Crosby, D. G. (Dep. Environm. Toxicol. Univ. Calif., Davis, CA) **Decontamination of 2,3,7,8-tetrachlorodibenzo-*p*-dioxin (TCDD) by photochemical action.** In: *Dioxin: Toxicological and Chemical Aspects.* Cattabeni, F., Cavallara, A., Galli, G., eds., (Spectrum Publ. Inc.: NY) Chapter 18: 185-189; 1978. (8 references)

While pure, crystalline TCDD is stable in sunlight for 14 days, it is exceptionally unstable toward UV light when dissolved in organic solvents. The loss of TCDD from herbicides, when exposed to sunlight, is rapid: 60% TCDD in Herbicide Orange on glass plates decomposed during exposure to 6 hr of sunlight. TCDD decomposition is even more rapid from leaf surfaces. Photochemical dechlorination is the principal factor in dioxin disappearance. Possible means of TCDD decontamination include mixing with appropriate light transmitting reagents prior to photoreduction.

79-0830. Hamilton, H. E.; Morgan, D. P.; Simmons, A. (Dep. Intern. Med., Coll. Med., Univ. Iowa, Iowa City, IA) **A pesticide (dieldrin)-induced immunohemolytic anemia.** *Environ. Res.* 17(2): 155-164; 1978. (21 references)

The unusual presentation of a factory worker with severe hemolytic anemia which remitted following splenectomy prompted a search for an environmental cause for red cell injury. The investigation showed the presence of an immunoglobulin in the patient's serum and on the red cells and small amounts of complement on red cells. The patient's serum caused agglutination of a normal person's red cells only when dieldrin-coated, a reaction blocked by first reacting the serum with dieldrin. The spleen of the patient had a greater than normal concentration of dieldrin, the source of dieldrin being dietary. It is concluded that dieldrin became immunogenic and provoked a chemical immunohemolytic anemia. The spleen played a major role in destruction of red cells injured by the immunopathic process and in accumulation of the antigenic substance dieldrin. (Author abstract by permission of Academic Press)

79-0831. Anonymous **Can air pollutants cause chronic lung diseases?** *Environ. Sci. Technol.* 12(13): 1356-1359; 1978.

Air pollution problems are magnified in persons who are suffering from various human disorders such as asthma, allergies, or chronic bronchial disease. An example is given of a middle-aged woman who, while working in her office, was exposed to fumes of malathion sprayed outside the building near an air vent. She felt ill, but no diagnosis was readily obtained. On returning to her office from the company physician, she experienced an overwhelming allergic reaction which was caused by the petroleum-based compound serving as the propellent for the malathion application.

79-0832. Biava, C. G.; Smuckler, E. A.; Whorton, D. (Dep. Pathol., Sch. Med., Univ. California, San Francisco, CA 94143) **The testicular morphology of individuals exposed to dibromochloropropane.** *Exp. Mol. Pathol.* 29(3): 448-458; 1978. (16 references)

Ten men working at factories that produce dibromochloropropane (DBCP) were subjected to testicular biopsies. Light and electron microscopic examination revealed normal to slightly reduced sperm formation with no deformities in men with slight exposure to the nematocide. Those with the longest exposure produced no sperm. An intermediate group demonstrated reduced sperm counts.

79-0833. Takeuchi, S.; Kameda, N.; Sato, T.; Kasukawa, R. (Second Sch. Intern. Med., Fac. Med., Fukushima Univ., Fukushima, Japan) **[A case of necropsy on acute intoxication due to paraquat dichloride.]** *Fukushima Igaku Zasshi (Fukushima Med. J.)* 27(6): 494; 1977. (Japanese)

A 25-yr-old woman swallowed approximately 150 ml of 25% paraquat dichloride in a suicide attempt and after repeated vomiting visited the hospital with symptoms of headache and pain in the oral cavity, clear consciousness, redness of oral mucous membrane and rales in the left pulmonary field. She was immediately treated with compensation, diuresis, cardiotonics, antibiotics, predonin and adsorbent as well as dialysis. However, with aggravation of headache, turbid consciousness, cough, pain in the abdomen and appearance of subcutaneous emphysema from neck to anterior breast, she died with respiratory failure within 44 hr of poisoning. Major findings on necrospy were: irregular fatty de-

generation and necrosis of the liver, vacuolar degeneration and necrosis of kidney tubule epithelium, necrosis of cortical bundlar belt of the suprarenal glands, myocardia lesions, and congestional tendency of the whole body. In the lungs, conspicuous congestion and hemorrhage of capillary vessels were observed without any fibrilar proliferation of stroma. A universal pneumatosis not previously observed before necropsy was noted in the lungs, submaxillary area, neck, anterior breast, mediastinum, posterior peritoneal tissue, and colon. Residues of paraquat dichloride in the liver and the kidney were, respectively, 0.09 and 0.29 μg/g, however, no paraquat dichloride was detected in the blood.

79-0834. Kaskevich, L. M.; Soboleva, L. P. (Inst. Hyg. & Toxicol. Pestic., Polymers & Plastics, Kiev, USSR) **Sluchai ostrogo otravleniya gerbitsidom 2-4-D (otdalennye posledstviya. [A case of acute poisoning by 2,4-D (late sequelae).]** *Gig. Tr. Prof. Zabol.* (10): 49-50; 1978. (1 reference) (Russian)

A 37-yr-old woman was followed up for 3.5 yr after accidental occupational acute poisoning of medium degree by 2,4-D. Headache, pains in the cardiac region and right hypochondrium, weakness, hypertension, tachycardia, excessive perspiration, and hepatomegaly were the general symptoms during the acute phase. Nausea, emesis, vegetative vascular paroxysms, stable hypertension, toxic encephalopathy, diffuse hepatomegaly, and portal hypertension were seen during the subsequent years. The findings indicate that patients who suffered acute poisoning by 2,4-D require long-term follow-up.

79-0835. Dzhaparov, A. K.; Karimov, V. A. (Inst. Sanit., Hyg. & Occup. Dis., Tashkent, USSR) **Sostoyanie metabolitov i aktivnost' fermentov uglevodnogo obmena u bol'nykh s khronischeskoj intoksikatsiei khlo- i fosfororganicheskimi pestitsidami. [State of metabolites and the activity of carbohydrate metabolizing enzymes in patients with chronic organochlorine and organophosphorus pesticide poisoning.]** *Gig. Tr. Prof. Zabol.* (11): 28-29; 1978. (8 references) (Russian)

Metabolite levels and carbohydrate metabolizing enzyme activities were studied in 95 patients with chronic poisoning with organochlorine and organophosphorus pesticides (DDT, BHC, heptachlor, chlordane, demeton-*O*-methyl, trichlorfon, parathion, dimethoate, and formothion). The patients have been exposed to the pesticides occupationally for 1-16 yr. Hepatic changes were found in 73% of the patients. Mild poisoning was seen in 54 patients, poisoning of medium degree in 40. The blood glucose level was reduced significantly in 16.8% of the patients (48-69 mg%), and at the lower limit of the normal range in the others. The serum lactic acid level was significantly increased compared with healthy controls, and it was significantly higher in the patients with medium degree of poisoning than in those with mild poisoning. The serum glucose-6-phosphatase activity was significantly increased (0.388 μ*M* of P per ml per hr in patients with mild poisoning, and 0.514 μ*M* of P per ml/hr in those with medium degree of poisoning, versus 0.076 μ*M* of P per ml/hr in the controls; $p < 0.001$ and $p < 0.001$, respectively). The serum lactate dehydrogenase activity was also increased significantly: 326 U in the patients with mild poisoning and 384 U in those with medium degree of poisoning, versus 178 U in the controls ($p < 0.01$ and $p < 0.05$, respectively). The findings indicate disturbances in the carbohydrate metabolizing enzyme activities and change in the metabolite levels. These changes are probably due to the toxic liver damage.

79-0836. Yakubova, R. Ya.; Shukrullaev, I. Sh. (Author address not given) **O techenii i posledstviyakh infektsionnogo gepatita u lits, primenyayushchikh pestitsidy v sel'skom khozyaistve. [Course and sequelae of infectious hepatitis in workers using pesticides on farms.]** *Gig. Tr. Prof. Zabol.* (11): 57; 1978. (Russian)

The course and sequalae of infectious hepatitis was investigated in 68 patients exposed to organochlorine and organophosphorus pesticides occupationally (33 patients) or indirectly (35), and in 60 non-exposed control patients. Blood and urine samples from 30 exposed patients were investigated for pesticides; they were found in 12/30 blood samples (average 0.125 mg%) and in 18/30 urine samples (0.32 mg%). Compared with the controls, juandice developed earlier in the exposed patients, and they had pronounced dyspeptic and asthenovegetative disorders; the course of the hepatitis was more sever and protracted. Pronounced bilirubinemia was more frequent, the aldolase and transaminase levels were higher, and hypoalbuminemia and hypergammaglobulinemia were more pronounced. The serum cholinesterase activity was also reduced. Residual symptoms (asthenovegetative syndrome, hepatomegaly, icteric sclera, changes in the proteinogram, pathological transaminase activity) were more frequent during the convalescence in the exposed patients than in the controls. The more serious course of infectious hepatitis in the exposed patients is due to the hepatotropic action and accumulation of the pesticides.

79-0837. Yamanouchi, H.; Shimada, E.; Yamamura, Y.; Iwata, M. (Sch. Public Health, St. Mariana Med. Coll., Kawasaki, Kanagawa, Japan) **[Dynamic change of inorganic arsenic and methyl arsenic in human urine after oral intake as As_2O_3.]** *Jpn. J. Public Health (Nippon Koshu Eisei Zasshi)* 25(10): 560; 1978. (1 reference) (Japanese)

Results of determinations on the change in the chemical state of metabolic products of arsenic (As^{3+}) with time are reported. The pattern of arsenic exretion of urine after administration of As_2O_3 as a single oral dose to male adults is examined. After dosing with 10 μg As/kg body weight, approximately 25% of the compound was excreted as As^{3+} and a very small amount was found as As^{5+}. The larger fraction was composed of the metabolites monomethylarsonic acid and dimethyl-arsonic acid. Approximately 60% of the arsenic was excreted by 72 hr after ingestion. [At the 37th Annual Meeting of the Japanese Socity of Public Health.]

79-0838. Iwata, Y.; Carman, G. E.; Gunther, F. A. (Dep. Entomol., Univ. California, Riverside, CA 92521) **Worker**

environment research: methidathion applied to orange trees. *J. Agric. Food Chem.* 27(1): 119-129; 1979. (24 references)

Methidathion (Supracide) was applied to orange trees, and residue levels of methidathion and its oxygen analogue on substrates pertinent to field worker safety were determined. Primary emphasis was placed on dislodgable foliar residues, but dislodgable fruit residues, grove dust residues, and pesticide concentration in air were also determined. Prebloom, postbloom, and early and late summer treatments were made to encompass the normal seasonal application periods; climatic data were collected. Three different geographical areas in California were used. Applications included two dilute spray rates and one low-volume rate. Posttreatment residue levels depended on initial pesticide deposition. High atmospheric oxidant levels did not correlate with enhanced oxon formation due to the many variables operative in the tests conducted. (Author abstract reprinted by permission of the American Chemical Society)

79-0839. Richards, D. M.; Kraus, J. F.; Kurtz, P.; Borhani, N. O.; Mull, R.; Winterlin, W.; Kilgore, W. W. (Dep. Community Health, Sch. Med., Univ. California, Davis, CA 95616) **A controlled field trial of physiological responses to organophosphate residues in farm workers.** *J. Environ. Pathol. Toxicol.* 2(2): 493-512; 1978. (10 references)

Eighteen male farm workers ranging in age from 18 to 57 yr participated in a study to determine the effects of organophosphate residues on farm workers re-entering the fields. Eight of the men worked in a plot treated with Guthion (azinphos-methyl). The individual CHE activities of the workers indicated no adverse health response to Guthion residues under the exposure conditions of this trial. The daily mean percent change in ACHE and PCHE activities was less than -10.0% of baseline values. Daily group-mean urinary metabolite excretion levels for workers in the treated plot were highly correlated with the daily group-mean percent change in ACHE activity levels. There was a much slower decay in Guthion residues in this trial than in a comparable study conducted one year prior to this time. This indicates the difficulty in setting re-entry intervals based on time elapsed since application of the chemicals.

79-0840. Ahling, B.; Wiberger, K. (Swed. Water & Air Pollut. Res. Inst., S-100 31 Stockholm, Sweden) **Incineration of pesticides containing phosphorus.** *J. Environ. Qual.* 8(1): 12-13; 1979. (5 references)

Fenitrothion and malathion are commonly used as pesticides in farming and gardening. Residues of these compounds can be found in wastes from these activities, such as sprayed material and packaging. This report describes experiments carried out to investigate the possibility of destroying these wastes by incineration. The investigations show that combustion of fenitrothion and malathion at low termpatures ($< 600°C$) gives emissions of 1-2% of the amount of pesticide introduced. To insure safe destruction (emission $<$ 100 mg unburned/kg introduced), a temperature above 700°C and a transit time of 3-4 sec are needed. In the case of shorter transit times, the temperature should exceed 800°C. (Author abstract by permission)

79-0841. Kawar, N. S.; Gunther, F. A.; Serat, W. F.; Iwata, Y. (Dep. Entomol., Univ. California, Riverside, CA 92521) **Penetration of soil dust through woven and nonwoven fabrics.** *J. Environ. Sci. Health B*13(4): 401-415; 1978. (5 references)

Possible penetration of various fabrics by soil particles which could carry pesticide contamination was evaluated. The fabrics tested included a knotted jersey, a woven fabric made from 1:1 cotton-polyester, a woven fabric of 100% cotton, and a knitted jersey of 100% cotton. Two disposable nonwoven fabrics made of paper or of paper over a polypropylene net were also examined. The dust containing 100 mg analytical grade parathion completely penetrated all knitted jersey fabrics under test conditions, up to penetrations of 87 to 96%, whereas woven fabrics allowed only 0.3 to 5.8% of the dust to pass through. Non-woven fabrics allowed less than 0.3% of the applied dust load through the fabric. Conversion of parathion to paraoxon was seen in the soil dust particles after weathering.

79-0842. Hardell, L.; Sandstrom, A. (Author adress not given) **Maligna mesenkymala mjukdelstumoerer och exposition foer fenoxisyror eller klorfenoler. Case-control-studie. [Malignant mesenchymal soft-tissue tumors and exposure to phenoxy acids or chlorophenols. A case control study.]** *Lakartidningen* 75(49): 3535-3536; 1978. (5 references) (Swedish)

The relationship between occupational exposure to phenoxy acids and/or chlorophenols and the incidence of soft-tissue sarcomas was studied in a series of 52 patients with soft-tissue sarcomas and 205 matched controls in a cohort study. The incidence of exposure was 19/52 among the tumor patients and 19/206 in the tumor-free controls ($p < 0.001$). The relative risk was determined to be 5.3 for exposure to phenoxy acids, and 6.6 for exposure to chlorophenols. The findings indicate a definite correlation between past occupational exposure to phenoxy acids and chlorophenols and malignant mesenchymal soft-tissue tumors. As all exposed patients may have been exposed to impurities as well, (dioxins and TCDD in particular), it is impossible to evaluate the effects of the individual substances. The increased risk of malignant mesenchymal soft-tissue tumors may thus be due to phenoxy acids, chlorophenols, their impurities, or both.

79-0843. Takahashi, T.; Yamamoto, K.; Sawai, T.; Okubo, T.; Mukoda, T.; Minagawa, N.; Sugaya, H. (First Sch. Pathol., Fac. Med., Tohoku Univ., Sendai, Japan) **[Examination of 5 cases of autopsies of paraquat dichoride intoxications, especially lesions of parenchymatous organs.]** *Nippon Byorigakkai Kaishi (Trans. Soc. Pathol. Jpn.)* 67: 138-139; 1978. (Japanese)

Findings on autopsies of 5 cases of intoxication by paraquat dichloride are summarized for victims who died 1, 3, 6, 19, and 42 days after swallowing the herbicide. Acute necrosis of central hepatocytes and edematous degeneration with necrosis of bile duct epithelium of the Glisson's capsules occurred in the liver of 3 cases. Fibrosis remained centered

in Glisson's capsules in a case of chronic exposure to paraquat. In the pancreas, epithelial edematous degeneration and necrosis were found extensively in pancreatic ducts of 2 cases. Epithelial metaplasia and retentional cysts predominated in the chronic case. Anuria occurred in all cases with severe necrosis of renal tubules, however, it was centered in tubules remote from Henle's loop, resembling symptoms of renal shock. In the adrenal cortex, necrosis appeared acutely. In blood vessels, fibrinoidal necrosis of the small arteries of the pancreas, kidney, and liver was observed on days 3-6 of illness, and was considered to be the result of injuries to vessel walls by paraquat or contraction of arteries with reaction to shock. The above-mentioned findings were clearer in cases of early death which were seemingly dose dependent. In the lung, typical findings of paraquat-induced lesions were observed in cases of death after more than 3 days. Focal hemorrhage was outstanding in general resembling abnormality of the circulatory system as caused by pulmonary lesion due to intoxication by paraquat.

79-0844. Takayama, K.; Takeuchi, K.; Suga, E.; Iwabuchi, K.; Tomichi, N. (First Sch. Pathol., Fac. Med., Iwate Med. Coll.) **[A case of autopsy on paraquat dichloride intoxication.]** *Nippon Byorigakkai Kaishi (Trans. Soc. Pathol. Jpn.)* 67: 139; 1978. (Japanese)

A case of paraquat poisoning is reported in a 22-yr-old female who intentionally ingested the pesticide in her 7th month of pregnancy. The victim, after swallowing about 60 ml of technical paraquat dichloride, vomited up about half of the amount ingested. A stomach wash was performed at 3.5 hr after the paraquat intake. Reduction of urination, edema, hypernitremia, and jaundice appeared three days after swallowing, and coughing and production of sputum became frequent after five days, with appearance of shadows in the lungs. Fetal heartbeat disappeared on the 13 day, and on the 14th day the dead fetus was delivered. The mother died on the 17th day in spite of blood dialysis and oxygen tent therapy begun on the 10th day to aid her difficulty in breathing. Autopsy findings revealed major lesions in the lungs, kidneys, liver, and pancreas. Lung weight and volume was increased with diffuse fibroblast proliferation, edema, and hemorrhage in repleted areas. Alveolar vacuoles were filled with fibrin and collagenous fibers. Partial edema of alveolar walls with proliferation of fibroblasts was also noted. In the kidneys, degradation of renal tubule epithelium with fatty degeneration and glassy droplets was observed. Tubules were filled with granular and cylindrical hemoglobin indicating lower nephron disease. In the liver, fatty degeneration centered in the lobules and clogging of bile ducts was observed. Stagnation of the pancreal duct in the central part of the acinus was also found. In addition, the lungs of the dead neonate showed extension and hyperemia of the peripheral cavity which was filled with debris of the amniotic fluid. It was suggested that the fetus began intra-uterine respiration to compensate for the insufficient oxygen supply due to the intoxication of the mother's body, however, no symptoms of direct paraquat poisoning were noted in the body of the neonate.

79-0845. Koike, M.; Ninomura, N.; Yamanaka, A.; Takahashi, A. (Dep. Pathol., St. Lucas Hosp., Tokyo, Japan) **[Histopathological study on pulmonary lesions in the case of intoxication due to paraquat dichloride.]** *Nippon Byorigakkai Kaishi (Trans. Soc. Pathol. Jpn.)* 67: 272-273; 1978. (Japanese)

Results of autopsies on five deaths due to suicide by swallowing paraquat dichloride were reported. The deaths occurred 21 and 60 hr, and 13, 27, and 88 days after ingestion of the pesticide. In the two acute cases, injuries to parenchymatous cells of the liver, kidneys, and adrenal gland were observed. Congestion, edema in pulmonary septum and alveoles, and hemorrhage in pulmonary alveoles were observed with scattered formation of hyaline membranes in the case of death after 60 hr. In the case of death after 13 days, collapse of alveoles, thickening of septum, a slight proliferation of collagen fibers, and intra-alveolar slight proliferation of fibroblasts and collagen fibers were found with scattered formation of hyaline membranes, from alveolar tubules to bronchioles, accompanied by hemorrhaging. In the case of death after 27 days, an extensive collapse of the pulmonary cavity under the pleura with reduced lower lobe was observed. Proliferation septum separated from the pleura thickened irregularly with collapsed alveoles. Relatively dense collagenization in a part of bronchiolar cavity and alveolar tubules was observed. In the case of death after 88 days, the belt-like collapse under the pleura was also observed along with diffuse proliferation of collagen fibers in the collapsed cavity with irregular fibrilization in other parts. In both the upper lobes, enormous cysts were observed. A slight dilation was found in bronchioles which was centered in the fibrilated foci in the lower lobe, however, no symptoms of cellulitic lung were found. In general, fibrosing alveolitis accompanied by fibrilization in alveoles was obvious in lungs intoxicated by paraquat dichloride.

79-0846. Sagaya, H. (Inst. Rural Med., Hiraga Gen. Hosp., Hiraga, Akita, Japan) **[Clinical studies on intoxication due to pesticides for agricultural use. Results of recent four years.]** *Nippon Noson Igakkai Zasshi (J. Jpn. Assoc. Rural Med.)* 27(4): 661-667; 1978. (Japanese)

Investigations of rural clinical reports on a total of 659 cases (336 male and 323 female) due to pesticide intoxication from 1973 to 1976 are reported. The number of incidents are relatively the same for each year. A high incidence occurred in 40-, 50-, and 30-yr-olds (in decreasing order). Infant poisoning was usually due to accidental ingestion and suicidal intent was a frequent cause in adults. (Fatalities occurred in 40 cases, 11 due to paraquat ingestion). A larger number of cases (60.8%) were reported during the summer months (July, June, August and May; in decreasing order), correlating with the season of application. Organophosphorus pesticides were implicated in 30.1% of the intoxications, herbicides in 10.2%, sulfur-containing pesticides in 7.7%, with a noticeable number of these due to nicotine sulfate. A high percentage of adults (18.7%) failed to continue clinical therapy after initial treatment. Suggestions for instructing pesticide applicators about safety measures are made.

79-0847. Sugaya, H.; Hayashi, S.; Komatsuzaki, O.; Kimura, M.; Tachikawa, H.; Kameda, T.; Hanada, K.; Suzuki, T.; Ito, S.; Kotanagi, A.; Hayashi, M.; Hario, K.; Kurokawa, S.; Okubo, S. (Inst. Rural Med., Hiraga Gen. Hosp., Hiraga, Akita, Japan) **[Studies of health-administration of persons engaging in pesticides application.]** *Nippon Noson Igakkai Zasshi (J. Jpn. Assoc. Rural Med.)* 27(4): 668-671; 1978. (7 references) (Japanese)

Results of investigations on medical therapy and treatment of persons engaged in pesticide appliation between 1973 and 1976 are summarized. An average of 40-60% of the reported cases occurred during the application season, the 4 summer months. A higher incidence of cases were reported in operators using organophosphorus, organochlorine or sulfur-containing pesticides. Examinations of hepatic and renal function indicated no abnormalities. Hematology studies revealed abnormal hemoglobin values in older adults, but were otherwise normal. Positive patch tests were obtained in 20-30% of those tested.

79-0848. Matsushima, S.; Horiguchi, Y.; Ide, H.; Kurosawa, K.; Yokoyama, T.; Yanagisawa, T.; Asanuma, N.; Suzuki, A.; Ueki, S. (Dept. Health Adm., Saku Gen. Hosp., Usuda, Nagano, Japan) **[Studies on the method of health administration on peoples engaging in pesticide application. Discussion on the results of medical examination on pesticide applicating farmers on highland vegetables and flowers.]** *Nippon Noson Igakkai Zasshi (J. Jpn. Assoc. Rural Med.)* 27(4): 672-684; 1978. (7 references) (Japanese)

Results of health examinations based on a self-recording health calendar and the method of determining serum cholinesterase activity in people engaged in pesticide application are discussed. The percentage of those having symptoms of pesticide poisoning in 1976 was 12.8% in men and 15.3% in women. The symptoms usually occurred from June to September, the season of pesticide application to highland vegetables and flowers. The subjective symptom most recorded was headache. Abnormal EEG values were frequently noted in male pesticide applicators during medical examinations. The self-recording health calendar is considered to be a useful monitoring tool. The DNTB method was found to be the best method for determining serum cholinesterase activity.

79-0849. Nagata, H.; Izumiyama, T.; Saito, M.; Kobayashi, S.; Suzuki, K.; Kamata, K.; Yamagishi, M.; Kurotani, S.; Takano, S.; Masui, T. (Hokushin Gen. Hosp., Nakano, Nagano, Japan) **[Results of health examination in recent four years on the growers of apples and grapes.]** *Nippon Noson Igakkai Zasshi (J. Jpn. Assoc. Rural Med.)* 27(4): 685-694; 1978. (13 references) (Japanese)

Results of health examinations of the past 4 yr on farmers using pesticides and operators of pesticide speed sprayers are reported. It was found from the self-recording calendar that the pesticides usually causing acute poisoning were organophosphates and nicotine sulfate. Specially designed protective clothing and gas-masks are used to prevent nicotine sulfate poisoning, however, operators still have a higher percentage of symptoms than applicators of ther pesticides. Abnormalities in EEG's were higher during the pesticide application season. Four patients with hepatic impairment were found to have had high degrees of serum cholinesterase activity reductions in 1965-67, as well as critical values in their hepatic function tests of that time. It is suggested that patients with critical values be monitored carefully.

79-0850. Uchida, A.; Ishige, T.; Takamiya, T. (Dep. Rural Med., Inst. Environ. Epidemiol., Fac. Med., Chiba Univ., Chiba, Japan) **[Relationship between the application of pesticides and the health state of the pesticide applicators in Chiba prefecture.]** *Nippon Noson Igakkai Zassi (J. Jpn. Assoc. Rural Med.)* 27(4): 695-705; 1978. (18 references) (Japanese)

Results of health examinations on farmers engaging in pear growing, in vegetable growing in green houses and operators of speed sprayers in the past 3 yr are reported. The occurrence of symptoms was highest in persons who applied fenitrothion or combined applications of fenitrothion, thiophanate and thiophanate combined with DD. No case of intoxication was severe enough to call for medical treatment. The occurrence of abnormal EEG in speed sprayer operatores was observed, however, no relationship could be established to other medical indices. Reduction of serum cholinesterase activity was observed in general. However, no clear relationship was found between the reduction and the pesticide application. Knowledge of pesticides and safe practices by the applicators was poor.

79-0851. Kato, T.; Nishikawa, T.; Kato, H.; Morishita, M.; Yamamoto, S.; Ogura, K.; Noda, H.; Suzuki, H.; Tsutsui, J.; Wada, K.; Minami, E. (Chuusei Gen. Hosp. Tsu, Mie, Japan) **[Studies on the method of health administration of farmers engaging in pesticide application.]** *Nippon Noson Igakkai Zasshi (J. Jpn. Assoc. Rural Med.)* 27(4): 706-711; 1978. (3 references) (Japanese)

Results of medical examinations on pear growers (1973 and 1974), citrus growers (1975) and vegetable growers (1976) are reported. There were 283 people examined in the busy season and 258 in the off season. The number of persons with high GOT or GPT values reduced yearly. A number of persons with slightly reduced cholinesterase activity were found every year, but no cases of moderately reduced cholinesterase activity were found after 1974. A relatively high number of cases with hypertrophy of the left ventricle was noted every year, in every season, with no difference between busy and off seasons. A considerably large number of persons developed hypertension. Those with more than 19 ppm Hg in their hair were rare. Incidences of anemia were noted every season and every year. Due to the inclusion of so many factors, correlation of the results with pesticide application could not be made.

79-0852. Takamatsu, M.; Maeda, K.; Hisanaga, T.; Hara, K.; Inoue, Y.; Nakagishi, R.; Abe, J.; Mizoguchi, K.; Cho,

M.; Rikimaru, T.; Okazaki, F.; Sakurai, T.; Goto, T.; Yamada, H.; Hirayama, H.; Teruyama, H.; Kinosaki, E. (Sch. Environ. Med., Fac. Med., Kurume Univ., Kurume, Fukuoka, Japan) **[Studies on the method of health administration of farmers engaging in pesticide application, especially of those engaging in horticulture facilities such as vinyl and glass green houses.]** *Nippon Noson Igakkai Zasshi (J. Jpn. Assoc. Rural Med.)* 27(4): 712-722; 1978. (5 references) (Japanese)

Results of medical examinations of 1973-1976, on farmers working in vinyl greenhouses in the Chikugo region of Kysushu, are reported. The number of work days per year was over 300, with an ave of 20-29 days of pesticide application per year. Among strawberry growers complaints of illness averaged 33.3% in men and 28.2% in women during the time of pesticide use. Poisoning incidents due to pesticides averaged 3.8% in strawberry growers and 9.0% in eggplant growers. The most common symptom of poisoning was a rash developed after chlorothalonil or captafol use. Other findings include: 20-30% incidence of anemia in women; 12-17% incidence of hypertension in all workers; and some abnormal hepatic function and EEG values. However, these values could not be directly correlated with pesticide use.

79-0853. Arimatsu, N.; Furushiro, Y.; Misumi, J.; Ueda, A.; Nomura, S. (Sch. Public Health, Fac. Med., Kumamoto Univ., Kumamoto, Japan) **[Results of investigation on the skin impairment of applicators of colorants and antiseptics on citrus fruits.]** *Nippon Noson Igakkai Zasshi (J. Jpn. Assoc. Rural Med.)* 27(4): 723-733; 1978. (9 references) (Japanese)

Investigations on incidents of skin disease in citrus growers, due to application of lime-sulfur, wettable sulfur, thiopanate-methyl or benomyl to citrus fruit to prevent discoloration and spoilage, from 1973 to 1976 are reported. The yearly occurrence of skin disease was 93 (54%) in 1973 and in 1974, 207 (63%) in 1975 and 74 (38%) in 1976. There was a greater frequency of incidence in women than in men. Most cases were irritation of the skin in the area of the abdomen. Pacht tests indicated that maneb caused the greatest primary irritation, followed by benomyl and thiophanate-methyl. Use of protective creams or other anti-rash agents was strongly recommended. A schedule of pesticide application was outlined.

79-0854. Nomura, S.; Matsushita, T.; Kambe, Y.; Kimura, M.; Horiuchi, N.; Sugaya, H. (Sch. Public Health, Fac. Med., Kumamoto Univ., Kumamoto, Japan) **[Studies on the standards of diagnosis in dermatitis due to pesticides. A summary of the studies from 1973 to 1976.]** *Nippon Noson Igakkai Zasshi (J. Jap. Assoc. Rural Med.)* 27(4): 734-741; 1978. (18 references) (Japanese)

An investigation consisting of clinical studies, field tests and animal experiments was done to establish a standard procedure to follow in patch tests of pesticides which may cause dermatitis. A 48 hr incubation time is recommended. The following guide is used to evaluate the reactions 30 to 60 min after removal of the patch: no reaction (-), slight redness (±), redness under the patch (+), redness and edema (++), redness, edema, vesicles and papules (+++) and large vesicles (++++). Distinction between primary irritiation, allergic dermatitis and eczema should be noted. Observation for delayed reactions is recommended. It is noted that other agents may cause similar dermatitis reactions.

79-0855. Nomura, S.; Matsushita, T.; Arimatsu, T. (Sch. Public Health, Fac. Med., Kumamoto Univ., Kumamoto, Japan) **[Studies on the application of patch test in the diagnosis of dermatitis due to pesticides.]** *Nippon Noson Igakkai Zasshi (J. Jpn. Assoc. Rural Med.)* 27(4): 742-746; 1978. (8 references) (Japanese)

Results of investigations to establish a standard patch test for pesticides are reported. A base material of 70% aqueous ethanol solution causes a stronger reaction than pure water and white vaseline. At 2 hr after removal of the patch the reaction is strongest. Material in the patch may cause a reduction, especially when the concentration of pesticide is low, masking to result. In cases where two different pesticides are applied simultaneously, results may differ from those obtained with only one pesticide.

79-0856. Itayama, T. (Second Agric. Adm., Div. Agric. & For. Nagasaki Prefect., Nagasaki, Japan) **[On an accidental intoxication due to cooperative pesticide application in Nagasaki prefecture.]** *Shokubutsu Boeki (Plant Prot.)* 32(12): 525-526; 1978. (Japanese)

A case of accidental intoxication which resulted in one death occurred in a village of Nagasaki Prefecture, July 1978 from a cooperative application to a paddy field of an insecticidal dust containing 2% propaphos and 1.5% carbaryl. The area sprayed was 243.3 ha and the amount of dust applied mainly by larger dusting machines was 7,770 kg. Of the 72 workers engaged in the application, 41 workers showed symptoms of nausea, abdominal pain, diarrhea, vomiting, pyrexia, sweating, increased blood pressure, miosis, spasm, and clouding of cousciousness. The cause of such a widespread and severe intoxication was attributed to a higher atmospheric temperature of 30°C at 9 a.m. with little wind; the climatic conditions caused sweating which accelerated the dermal absorption of the insecticides. Another cause considered was that the multi-holed pipe of the dusting machine, which was held by the workers, dusted the pesticides directly onto them. The physical condition of workers who had not had sufficient rest should also be considered.

79-0857. Tezuka, M. (Author address not given) **[Amendment of regulations of food sanitation law. I. New Approval of thiabendazole.]** *Shokuhin Eisei Kenkyu (Food Sanit. Res.)* 29(1): 23-27; 1979. (Japanese)

The standard use of the fungicide, thiabenazole has recently been approved. In consideration of the acute, subacute, and chronic toxicity of thiabendazole to experimental animals, its effects on reproduction, metabolism in mammals, and its mutagenicity to mammals have been investigated. Its effectiveness against green-mold rot on citrus, stem-end rot

on citrus, and black-end on bananas has also been determined. The formulations and the dosages of thiabendazole to be used on crop plants are given. The newly recommended residue levels for thiabendazole are less than 10 ppm on citrus, less than 3 ppm on bananas, and less than 0.4 ppm in the pulp of bananas.

79-0858. Tezuka, M. (Author address not given) **[The establishment of some pesticide residue tolerances on foods.]** *Shokuhin Eisei Kenkyu (Food Sanit. Res.)* 29(1): 28; 1979. (Japanese)

Maximum allowable concentrations for residues of the following pesticides on the following crop products have been newly established: fenitrothion on/in chestnuts, 0.2 ppm; dimethoate on/in tomato, 1.0 ppm; chlorfenvinphos on/in Japanese pear, 0.2 ppm; chlorpyrifos on/in Japanese pear, 0.5 ppm; fenitrothion on/in spinach, 0.2 ppm; chlorfenvinphos on/in persimmon, 0.2 ppm; fenitrothion on/in watermelon, 0.2 ppm; phosalone on/in watermelon, 0.1 ppm; and fenitrothion on/in carrot, 0.2 ppm.

79-0859. Yomura, Y.; Shibata, N. (First Sch. Intern. Med., St. Marianna Med. Coll., Kawasaki, Kanagawa, Japan) **[Studies on the intoxication due to the intake of foods fumigated with methyl bromide. Part 1. A case of intoxication due to methyl bromide, which started the studies.]** *St. Marianna Ikadaigaku Zasshi (St. Marianna Med. J.)* 6(3): 389-403; 1978. (67 references) (Japanese)

A case of acute and chronic intoxication of a worker due to inhalation of methyl bromide during fumigation operations was reported. The patient had experienced a slight intoxication due to inhalation of methyl bromide as much as 50 times previously during a 6 yr period. During fumigation operations, symptoms of heaviness in lower extremities, dizziness, diplopia, disturbance of gait, congestion, of conjuctiva, abnormal abdominal pain, and asthenopia appeared with fatigue in the extremities. Upon examination 2 days after the fumigation, agitation of the mind, horizontal nystagmus, distrubance of positional and movement senses, loss of vibrational sense, Romberg's phenomenon, abnormality in heel and knee tests, and gait instabilty were observed. However, these symptoms disappeared within 3 mo. Within 3.5 mo after the first occurrence of the symptoms, strong abnormal pain of the lower extremities, hypersensitivity to touch, a slight accentuation of patellar reflex, and ankle jerk appeared and persisted for 5 yr 7 mo. His disturbance of sensation was found to be symmetrical and stronger in remote areas with obscure upper limits. Longer recovery periods from the common cold were noted. Abnormalities of blood glucose levels and a tendency towards reduced urinary excretion of 17-OHCS were also observed.

79-0860. Kowalewski, S. (Kinder Klin., Univ. Bonn, D-5300 Bonn, BRD) **Erste Massnahmen bei akuter vergiftungsfallen im kindesalter. [Emergency treatment of children with acute poisoning.]** *Therapiewoche* 28(41): 7565, 7568, 7571; 1978. (German)

General principles of first aid and emergency treatment of children with acute poisoning by drugs, household detergents, chemicals, plants, pesticides and other materials are outlined. It is important to distinguish between a manifest poisoning and poisoning in the asymptomatic interval, and to reconstruct, as closely as possible, the nature and quantity of the substance ingested, and the time of the poisoning. In the absence of contraindications emesis should be induced by ipecac syrup.

79-0861. Knaak, J. B.; Maddy, K. T.; Gallo, M. A.; Lillie, D. T.; Craine, E. M.; Serat, W. F. (California Dep. Food & Agric., Sacramento, CA 95814) **Worker reentry study involving phosalone application to citrus groves.** *Toxicol. Appl. Pharmacol.* 46(2): 363-374; 1978. (8 references)

This study was conducted to provide information for the establishment of a worker reentry period after applying phosalone to citrus groves in California. Fourteen healthy male agricultural workers (volunteers) ranging in age from 18 to 72 yr were given physical examinations, including cholinesterase (ChE) determinations, prior to their entry into the phosalone-treated grove; four individuals treated in like manner served as controls. Blood and urine were sampled at the end of each work day. Two separate areas of a citrus grove were treated (6 lb per acre), so that the workers would enter the respective areas 14 or 21 days after the application. Cloth patches were attached to clothing at four sites (chest, shoulder, thigh and back) to collect dislodgeable residues for analysis. Leaf samples were taken to determine the dislodgeable residue of phosalone and its oxon at Day 0 and intervals thereafter. No adverse effects were observed with dislodgeable residues as high as 3.6 $\mu g/cm^2$ and no phosalone or its metabolites (phosalone-oxon and 2-amino-5-chlorophenol) were detected in urine. The red blood cell ChE activity of the workers was not significantly different from controls according to the t test on deviations, while the deviations in plasma ChE activity of the workers and controls were significantly different in both the 14- and 21-day studies. Dislodgeable residues on cloth patches were lower in the 14-day study and reflected the differences in dislodgeable residues on leaves for the two reentry periods. On the basis of this study, health scientists recommended a 21-day reentry interval. (Author abstract by permission)

See also 79-0792, 79-0803, 79-0804, 79-0909 *and* 79-0940.

79-0862. Homor, G.; Kasa, P. (Cent. Res. Lab., Med. Univ., Szeged, Hungary) **Acetylcholinesterase resynthesis after DFP poisoning: histochemical and biochemical study.** *Acta Histochem.* 62(2): 293-301; 1978. (31 references)

Studies were conducted to determine histochemical and biochemical alterations in the synthesis of acetylcholinesterase after poisoning with DFP. DFP was injected into spinal ganglia of rats. Simultaneously, atropine was injected ip. The ganglia were excised after 2 hr. Frozen sections were prepared and histochemical demonstration of AChE activity was determined. Tritiated DFP was used as above for determining incorporation and axoplasmic transport, using autoradiographic techniques. Intraganglionically administered DFP inhibits acetylcholinesterase activity of the large ganglion cells only. Tritiated DFP was traced to the same sites as acetylcholinesterase. DFP inhibits acetylcholinesterase activity by 96%; within several hours, however, the enzyme activity has returned to 27% of original activity.

79-0863. Hatch, R. C.; Clark, J. D.; Jain, A. V. (Diagn. Assist. Lab., Coll. Vet. Med., Univ. Georgia, Athens, GA 30602) **Use of thiols and thiosulfate for treatment of experimentally induced acute arsenite toxicosis in cattle.** *Am. J. Vet. Res.* 39(9): 1411-1414; 1978. (17 references)

Sodium arsenite was given at a dose of 25 mg/kg via stomach tube to 24 beef heifers. This is a lethal dose. After 12 hr, 5 groups of 4 heifers were treated parenterally with either sodium thiosulfate, cysteine HCl, thioctic acid, dimercaptopropanol, or thioctic acid combined with dimercaptopropanol. One group served as controls and their mean survival time was 31 hr. Neither sodium thiosulfate nor cysteine HCl was beneficial for treatment. Thioctic acid caused a reduction in the blood arsenic concentration. Illness was less severe and survival time increased to 56 hr in 1 heifer with a mean survival time of 38.7 hr. Dimercaptopropanol did not alter survival time or the severity of arsenite toxicosis, but did have a slightly beneficial effect on blood arsenic concentration and packed cell volume. Combined therapy with dimercaptopropanol and thioctic acid decreased the severity of the toxicosis in 3 heifers, prolonging survival time to 84 hr in 1 heifer with a mean survival time of 49 hr. None of the treatments significantly affected the erythrocyte glutathione concentration.

79-0864. Congregado, F.; Simon-Pujol, D.; Juarez, A. (Dep. Microbiol., Fac. Farm., Nucleo Univ., Pedralbes, Barcelona 28, Spain) **Effect of two organophosphorus insecticides on the phosphate-dissolving soil bacteria.** *Appl. Environ. Microbiol.* 37(1): 169-171; 1979. (8 references)

Dimethoate and malathion added to soil at 10 and 100 μg/g caused an initial stimulation of CO_2 production. Total counts of bacterial propagules were increased. All insecticide applications increased producing phospholipases from 1 wk until 4 wk after the application; bacteria then returned to the original levels. (Author abstract by permission)

79-0865. Mundy, R. L.; Bowman, M. C.; Farmer, J. H.; Haley, T. J. (Natl. Cent. Toxicol. Res., FDA, US HEW, Jefferson, AR 72079) **Quantitative structure activity study of a series of substituted *O,O*-dimethyl *O*-(*p*-nitrophenyl) phosphorothioates and *O*-analogs.** *Arch. Toxicol.* 41(2): 111-123; 1978. (14 references)

The lethality of seven *O,O*-dimethyl *O*-(*p*-nitrophenyl) phosphorothioates and their corresponding oxons has been determined in adult, male mice. The anticholinesterase potency of the oxons for bovine, erythrocyte acetylcholinesterase has also been determined. The LD50 values in mg/kg were: methyl parathion, 33.1; fenitrothion, 988; Chlorthion, 794; dicapthon, 331, *O,O*-dimethyl *O*-(3-ethyl-4-nitrophenyl) phosphorothioate, 1396; and *O,O*-dimethyl *O*-(3-isopropyl-4-nitrophenyl) phosphorothioate, 1379, and *O,O*-dimethyl *O*-(3,5-dimethyl-4-nitrophenyl) phosphorothioate, 630. The lethality values for the *O*-analogs were: methyl paraoxon, 21.8; fenitrooxon, 120; chloroxon (2,4-D), 280; dicapthoxon, 102; dimethyl-3-ethyl-4-nitrophenyl phosphate, 191; dimethyl-3- isopropyl-4- nitrophenyl phosphate, 321; dimethyl-3,5-dimethyl-4-nitrophenyl phosphate, 630. The *p* I50 values for inhibition of bovine red blood cell cholinesterase by the oxons were: methyl paraoxon, 7.2; fenitrooxon, 6.2; chlorooxon, 7.0; dicapthoxon, 7.1; dimethyl-3-ethyl-4-nitrophenyl phosphate, 6.0; dimethyl-3-isopropyl-4-nitrophenyl phosphate, 6.0; and dimethyl-3,5-dimethyl-4-nitrophenyl phosphate, 5.4. All the substitutions on the 4-nitrophenyl nucleus decreased toxicity whereas conversion of the phosphorothioates to oxons increased toxicity. The substituted oxons were all less toxic than methyl paraoxon while the substituted phosphorothioates were all less toxic than methyl parathion. All substitions on the 3 position of the 4-nitrophenyl ring in the phenyl phosphates decreased anticholinesterase activity. The halogen substitution at positions 2 and 3 produced much less reduction in acetylcholinesterase activity than did alkyl substitution at position 3 or dimethyl substitution at 3 and 5. Partition coefficients of both the thioates and oxons were determined, and multiple regression analyses of lethality data were also performed. (Author abstract by permission, abridged)

79-0866. Nicholas, R. A.; Ordal, G. W. (Sch. Basic. Med. Sci., Univ. Illinois, Urbana, IL 61801) **Inhibition of bacterial transport by uncouplers of oxidative phosphorylation. Effects of pentachlorophenol and analogues in *Bacillus subtilis*.** *Biochem. J.* 176(3): 639-647; 1978. (9 references)

Analogs of the potent uncoupler of oxidative phosphorylation pentachlorophenol (PCP) were tested as inhibitors of proline and glycine transport by *Bacillus subtilis*. These analogs included less highly substitited chlorophenols and pentachlorothiophenol. Like PCP, they are non-competitive inhibitors of proline transport and uncompetitive inhibitors of glycine transport. However, the less highly substituted chlorophenols are weaker acids than PCP and also weaker inhibitors. Analysis indicated that the anionic form of the uncouplers is the inhibiting species. Pentachlorothiophenol,

a water-insoluble anion, is also a potent inhibitor. These results support previous studies that concluded that uncouplers of oxidative phosphorylation inhibit amino acid transport by binding at specific sites on proteins, the free energy of interaction stabilizing 'unproductive' conformations. Such specific interactions of uncoupler with protein are probably commonplace. (Author abstract by permission)

79-0867. Baars, A. J.; Jansen, M.; Breimer, D. D. (Dep. Pharmacol., Sylvius Lab., Univ. Leiden, Leiden, The Netherlands) **The influence of phenobarbital, 3-methylcholanthrene and 2,3,7,8-tetra chlorodibenzo- *p*-dioxin on glutathione *S*-transferase activity of rat liver cytosol.** *Biochem. Pharmacol.* 27(21):2487-2494; 1978. (42 references)

Specific activities and apparent Michaelis-Menten kinetic parameters were determined for glutathione (GSH) S-transferase activity (E.C. 2.51.18) in rat liver cytosol, towards styrene oxidate (STOX), 1.2-butylene oxide (BOX) and 1-chloro-2,4-dinitrobenzene (CDNB) as electrophilic substrates, before and after pretreatment with the drug-metabolizing enzyme inducers phenobarbital (PB), 3-methylcholanthrene (MC) and 2,3,7,8-tetrachlorodibenzo-*p*-dioxin (TCDD). The measured GSH *S*-transferase activities appear to obey Michaelis-Menten kinetics. In non-induced animals the apparent K*m* values of the transferase activities were equal for STOX vs GSH, but they differed by a factor of 2 for CDNB vs GSH and by a factor of 14 for BOX vs GSH. The apparent v*max* values in each combination of GSH and electrophilic substrate were equal, but differed by one order of magnitude for the mutual substrate combinations. Pretreatment of the rats with MC resulted in enhancement of all measured activities expressed in terms of cytosol protein, while TCDD only enhanced the activites expressed as per gram body wt. PB enhanced both activities when STOX was employed as substrate, but when CDNB was used as the substrate, only the activity per gram body wt increased. All pretreatments increased the V*max* values using CDNB as the substrate, while PB and MC had an enhancing effect using STOX; the V*max* using BOX was enhanced after TCDD administration only. The K*m* values using BOX as the substrate was lowered after MC pretreatment; TCDD pretreatment decreased the k*m* using STOX, while it increased the K*m* using CDNB. It is concluded that the GSH *S*-transferase system is inducible, but in contrast to the induction of the mixed function oxidase system, qualitative differences between the inducing effects of PB and MC were not observed. Use of TCDD as inducing agent, however, resulted in a different induction pattern, which may indicate that during induction with this agent different types of GSH *S*-transferases are involved. (Author abstract by permission)

79-0868. Seifert, J.; Casida, J. E. (Pestic. Chem. & Toxicol. Lab., Dep. Entomol. Sci., Univ. California, Berkeley, CA 94720) **Relation of yolk sac membrane kynurenine formamidase inhibition to certain teratogenic effects of organophosphorus insecticides and of carbaryl and eserine in chicken embryos.** *Biochem. Pharmacol.* 27(22): 2611-2615; 1978. (12 references)

One type of teratogenic effect induced in chicken embryos by a variety of organophosphorus (OP) and methylcarbamate (MC) insecticides is associated with lowered embryo NAD levels. This appears to result from inhibition of kynerenine formamidase, which impairs conversion of tryptophan to essential pyridine nucleotide cofactors. The yolk sac membrane and the embryonic liver contain two types of knyurenine formamidase, one sensitive and the other relatively insensitive to OP and MC inhibitors. The eserine-sensitive enzyme accounts for ,,26% of the overall activity for hydrolysis of *N*′,*N*′-diformyl- *L*-kynurenine. In studies with twenty-one OP insecticides and two MC compounds injected at day 4 of incubation, the inhibition of the eserine-sensitive kynurenine formamidase at day 9 of incubation correlates well with the lowering of NAD levels at day 12 of incubation and the intensity of teratogenic signs. Teratogens of this type combined high potency for inhibiting the relevant kynurenine formamidase in the yolk sac membrane early in development, and possibly in the liver at later stages, with adequate *in vitro* stability to maintain the inhibition through critical stages of embryogenesis. Thus, kynurenine formamidase joins acetylcholinesterase in the list of OP- and MC-sensitive enzymes of critical physiological significance. (Author abstract by permission)

79-0869. Cambon, C.; Declume, C.; Derache, R. (Unit. Inserm U 87, Univ. Paul Sabatier, F-31400 Toulouse, France) **Inhibition of acetylcholinesterase from foetal and maternal tissues after oral intake of carbaryl (1-naphthyl-*N*-methyl-carbamate) by pregnant rats.** *Biochem. Pharmacol.* 27(22): 2647-2648; 1978. (15 references)

Pregnant rats were given one dose of carbaryl at 50 mg/kg and were killed at 30 min, 1, 5, 12, or 24 hr later. Dosing was by oral intubation. Sprague-Dawley female rats which were not pregnant were treated with decreasing doses of carbaryl at 50, 25, 12.5, or 6.25 mg/kg and killed 1 hr later. Measurements of the activity of brain and blood AcHE of the mother rats showed clear cut inhibition, brought about by carbaryl or its metabolites after 30 min. This inhibition lasted about 12 hr. Carbaryl movement across the blood-brain barrier was fast and the inhibition of hepatic AcHE in the mother is long term. The activity of blood, brain and liver AcHE in the fetus dropped markedly 30 min after the mother was treated and was still seen 12 hr after treatment. This inhibition represented 20% of the fetal brain AcHE and over 25% of the blood and liver AcHE.

79-0870. de Jong, L. P. A. ; Wolring, G. Z. (Prins Maurits Lab., TNO, Rijswijk, The Netherlands) **Reactivation and aging of cylopentyl methylphosphonylated acetylcholinesterase in the presence of some 1-alkyl-2- hydroxyiminomethylpyridinium salts.** *Biochem. Pharmacol.* 27(24): 2911-2917; 1978. (15 references)

The effect of 2-hydroxy iminomethyl- 1-methylpyridinium methanesulphonate (P2S) and its 1-pentyl and 1-heptyl anologues on the reactivation and aging of acetylcholin-

esterase inhibited by cyclopentyl methyl phosphonofluoridate was studied at pH 7.5 and 25°. The reactions in the presence of the 1-pentyl- and 1-heptyl-pyridinium-oxime involve simultaneous aging of the inhibited enzyme, and reactivation and aging of the inhibited enzyme-oxime complex. The reactions in the presence of P2S are more complicated. Reinhibiton of the reactived enzyme by the phosphonylated P2S probably plays a substantial role in the reactivation process. The dissociation constants of the complexes of inhibited enzyme with the 1-pentyl- and 1-heptyl- pyridinium-oxide and the rate constants of reactivation and aging of these complexes were evaluated. From these results the maximum percentages of reactivation, which can be achieved with high concentrations of the oximes, are calculated as 30 and 48 for the 1-pentyl- and 1-heptylpyridinium-oxime, respectively. These oximes, which were found previously to accelerate the againg of acetylcholinesterase inhibited by ethyl dimethyl phosphoramidocyanidate (tabun), retard the aging of the cyclopentyl methylphosphonylated enzyme. Different mechanisms for the aging of the two inhibited enzymes are suggested. (Author abstract by permission)

79-0871. Goggelman, W.; Bonse, G.; Henschler, D.; Creim, H. (Dep. Toxicol., Gesellsch. Strahlen. & Umweltforsch., D-8094 Munich, BRD) **Mutagenicity of chlorinated cyclopentadienes due to metabolic activation.** *Biochem. Pharmacol.* 27(24): 2927-2929; 1978. (15 references)

Chlorinated cyclopentadienes of which hexachlorocyclopentadiene is used for pesticide synthesis is suggested to undergo metabolic conversion forming acylating and possibly mutagenic terachlorocyclopentadienone. Tetra-, penta-, and hexachlorocyclopentadiene differ in the chlorine substitution at C-1. Oxygen insertion into C-1, which results in the formation of the dienone should depend on the degree of chlorine substitution at this position. The dienone is not stable and can only be isolated as the dimer. To detect its formation an *in vitro*-test system, comprising mouse liver microsomes for metabolic activation and *E. coli* K 12 (343/113) to detect mutagenicity, has been used. According to the previous suggestions tetrachlorcyclopentadiene and pentafluorocyclopentadiene were highly mutagenic after metabolic activation, whereas hexachlorocyclopentadiene was not. (Author abstract by permission)

79-0872. Goldstein, B. D.; Rozen, M. G.; Quintavalla, J. C.; Amoruso, M. A. (Dep. Environ. Med., Med. Cent., New York Univ., New York, NY 10016) **Decrease in mouse lung and liver glutathione peroxidase activity and potentiation of the lethal effects of ozone and paraquat by the superoxide dismutase inhibitor diethyl dithiocarbamate.** *Biochem. Pharmacol.* 28(1): 27-30; 1979. (26 references)

Intraperitoneal injection of mice with sodium diethyl dithiocarbamate (1.2 g/kg), an inhibitor of superoxide dismutase, potentiated the lethal effects of ozone and of paraquat. Study of control mice injected with sodium diethyl dithiocarbamate demonstrated an 80% decrease in lung and liver superoxide dismutase activity in 1 hr, followed by a slow return towards normal. However, liver and lung glutathione peroxidase activity were also decreased, although to a lesser extent than superoxide dismutase, and the nadir was not observed until 6 hr and 30 min following injection. A decrease in liver non-protein sulfhydryl groups was also observed. Similarly, incubation of liver homogenate with diethyl dithiocarbamate produced a marked loss in superoxide dismutase activity associated with a lesser, delayed decrease in gluthione peroxidase. The latter could be prevented by the addition of superoxide dismutase or by anaerobic conditions. Accordingly, the potential of the lethal effects of exogenous agents by diethyl dithiocarbamate does not necessarily indicate a role for superoxide anion radical in the toxicity of these agents. (Author abstract by permission)

79-0873. Chipman, J. K.; Kurukgy, M.; Walker, C. H. (Dep. Physiol., Univ. Reading, Whiteknights, Reading RG6 2AJ, England) **Comparative metabolism of a dieldrin analogue: hepatic microsomal systems as models for metabolism in the whole animal.** *Biochem. Pharmacol.* 28(1): 69-75; 1979. (13 references)

The metabolism of the liposoluble dieldrin analogue HCE was studied *in vivo* and *in vitro* in the rat, rabbit, pigeon and Japanese quail. Comparisons were made between the metabolites formed by liver microsomal preparations and those released from conjugates in the bile and urine. Under both *in vitro* and *in vivo* conditions, metabolism was predmoninantly oxidative in all species with the formation of a major primary metabolites and the progressive conversion of this to two secondary metabolites. The pattern of oxidative metabolism after 30 min of microsomal incubation was broadly similar to that found in bile after 2 hr collection and in urine after 24 hr collection. A minor metabolic route involved hydration of HCE to a *trans*-diol by microsomal epoxide hydratase and this was found in all species except the pigeon both *in vivo* and *in vitro*. There were certain discrepancies between *in vitro* and *in vivo* studies with regard to the formation of minor metabolites and to the quantity of *trans* -diol formed relative to other metabolites. In the case of the rat, the rate of oxidative transformation by microsomes was much higher than the rate of excretion of the metabolites (both figures being expressed in terms of g liver), suggesting that the excretion rate was not limited by the metabolic rate. (Author abstract by permission)

79-0874. Fasco, M. J.; Piper, L. J.; Kaminsky, L. S.* (Div. Lab. & Res., New York State Dep. Health, Albany, NY 12201) **Cumene hydroperoxide-supported microsomal hydroxylations of warfarin. A probe of cytochrome P-450 multiplicity and specificity.** *Biochem. Pharmacol.* 28(1): 97-103; 1979. (25 references)

The hepatic microsomal metabolism of R and S warfarin, supported by NADPH or cumene hydroperoxide, has been investigated to probe the multiplicity and specificity of cytochromes P-450. Microsomes were uninduced, or chemically induced, from rat liver. Comparisons of the rates of formation of the metabolites supported by NADPH or cu-

mene hydroperoxide (with uninduced and induced microsomes) revealed that cumene hydroperoxide has several effects. The rates of hydroxylation of the phenyl substituent of warfarin (4'-hydroxywarfarin) were increased and the rates of metabolism of the aliphatic portion of warfarin were increased, except with S warfarin and uninduced microsomes. It was concluded from these studies that multiple cytochrome P450s are implicated in the metabolism of warfarin. Cytochrome P450 catalyzing 7- and 8- hydroxywarfarin formation differs from cytochromes catalyzing the other metabolites. For each metabolite of warfarin, the cytochrome P450 type predominantly responsible for its formation is the same, irrespective of the mode of induction of the microsomes. The effects of cumene hydroperoxide have been ascribed to differences in cumene hydroperoxide affinities, differences in its induced destruction, and differences in its inhibiton of warfarin binding to different cytochrome P450s, together with differences in the situation of cytochrome P450s in the microsomal membrane. (Author absract by permission, abridged.)

79-0875. Hanna, N. F.; Clay, J. C.; Harris, J. R. W. (Praed Street Clin., St. Mary's Hosp., London W2, England) **Sarcoptes scabiei infestation treated with malathion liquid.** *Br. J. Vener. Dis.* 54(5): 354; 1978.

The use of 0.5% malathion liquid in the treatment of sarcoptes scabiei infestation was studied on 127 consecutive male and female patients. Of these patients, 29 were adequetely followed-up. They ranged in age from 18 to 44 yr. Most had a history of symtpoms for less than a month. Skin symptoms persisted even after the burrows and mites had disappeared. At the conclusion of treatment, five patients were still affected with burrows or mites, or both. The 83% cure rate obtained in this study indicates that malathion at 0.5% is an acceptable alternative treatment for such infestation.

79-0876. Hogan, T. F.; Citrin, D. L.; Johnson, B. M.; Nakamura, S.; Davis, T. E.; Borden, E. C. (Dep. Human Oncol. & Med., Sch. Med., Univ. Wisconsin, Madison, WI 53706) ***o,p'*-DDD (Mitotane) therapy of adrenal cortical carcinoma.** *Cancer (Philadelphia)* 42(5): 2177-2181; 1978. (24 references)

Four case studies are presented in which patients with adrenal cortical carcinoma were treated with *o,p'*-DDD (Mitotane, TDE), at 5 - 10 g/day. All patients suffered drug toxicity and doses were reduced. No patient could withstand dosages over 6 g/day. Plasma levels were measurable up to 8.5 mo after stopping therapy. Trace levels of DDE and DDA were evident for 18 mo after treatment stopped.

79-0877. Fairshter, R. D.; Wilson, A. F. (Dep. Med., Irvine Med. Cent., Univ. California, Orange CA) **Paraquat and Marihuana.** *Chest* 74(4): 357; 1978. (7 references)

The possible consequences of spraying marihuana fields with the herbicide paraquat are discussed. Mortality following ingestion of concentrated liquid paraquat is about 50%, and studies in which liquid paraquat is instilled on rabbit lungs showed harmful effects. However, it is pointed out that these findings may not apply to paraquat-treated marihuana. There are no data on the amounts of paraquat-marihuana smoke inhaled and exhaled, and no human cases of paraquat-marihuana lung damage have been reported. Paraquat, which is easily pyrolyzed, may be destroyed by the burning of the leaves, and non-pyrolyzed paraquat may be absorbed by the upper airway.

79-0878. Cross, C. E.; Last, J. A. (Sch. Med., Univ. California, Davis, CA) **Paraquat goes to pot.** *Chest* 74(4): 358; 1978. (7 references)

The possibility of human lung injury following smoking of paraquat-contaminted marihuana is explored. It is estimated that 20% of the marihuana confiscated at the Mexican border is contaminated with paraquat, with an average concentration of 450 ppm. The studies on paraquat damage in lungs of animals are described: one in which rats are injected with large doses, and another in which small quantities of paraquat are instilled in the lungs of rabbits. It is pointed out that neither study was designed specifically to test the effects of paraquat-contaminated marihuana on human lungs. In addition, there are no case reports or epidemiology studies to serve as a basic for recommendations.

79-0879. Hutter, J. J. (Dep. Pediatr., Univ. Arizona, Tuscon, AZ) **Gamma benzene hexachloride toxicity in infants.** *Clin. Res.* 27(1): 97A; 1979.

Two case histories of infants given γ-benzene hexachloride (GBH, lindane), a chlorinated hydrocarbon pesticide, for treatment of scabies are described. In a 4-mo-old baby treated once with GBH, marked mental and motor retardation was seen in neurological testing 2 days after treatment. Blood GBH level was 0.1 μg/ml (normal < 0.001 μg/ml). In a 9-mo-old infant treated with GBH twice daily for one month, seizures developed which were considered to be due to CNS toxicity secondary to prolonged GBH application.

79-0880. Blekkenhorst, G. H.; Eales, L.; Pimstone, N. R. (UCT/MRC Porphyria Res. Group, Dep. Med. Med. Sch., Univ. Cape Town, South Africa) **The nature of hepatic cytochrome *P*-450 induced in hexachlorobenzene-fed rats.** *Clin. Sci. Mol. Med.* 55(5): 461-469; 1978. (34 references)

Studies were performed to determine the effects of hexachlorobenzene (HCB) ingestion on the hepatic and urinary porphyrins and hepatic cytochrome P450 of rats. Sixty rats were fed a standard diet containing 0.2% (w/w) HCB. At various time intervals up to 60 days, they were sacrified. Before sacrificing, 24 hr urine and feces were collected. Livers were removed for analysis. Urinary uroporphyrin increased to 44.14 μ mol/l in 60 days; the control was 0.51 μ mol/l. Coproporphyrin showed an increased of 10 μ mol/l over the control, and hepatic uroporphyrin was 47.27 nmol/l in the treated and only trace amounts were noted in the control.

Induced P450 indicated the presence of a greater admixture of hemoprotein distinct from cytochrome P450. The catalytic properties of the enzyme induced in the pesticide treated group showed different activities from the control group.

79-0881. Seizaburo, K.; Takabumi, I. (Dep. Pharmacol., Osaka Branch Natl. Inst. Public Health, Osaka, Japan) **Studies on the relationship between enzyme inhibition and fetal toxicity by organophosphorus insecticides.]** *Congenital Anomalies (Senten Ijo)* 18(3): 164-165; 1978. (Japanese)

Fetal toxicity of leptophos was studied in relation to its inhibitory action on cholinesterase and its effect on ATP-concentration in organs of Wistar rats orally administered with leptophos. The oral LD50 in mg/kg was 40 in males and 33 in females as compared to fenitrothion: 250 in males and 310 in females. Anomalies such as rumplessness, wavy ribs and abnormality in nasal cavity appeared in fetuses whose mothers had been fed 50 ppm leptophos for 7 days from conception. Reduction of body weight and delay of ossification were observed in fetuses whose mothers had been fed 125 ppm leptophos for the same period. Survival of neonates for 30 days was significantly lower in cases where the mothers were fed leptophos during the gestation period. Levels of ChE were high and constant in the brain, liver, fetal liver, fetal brain and mother's serum, however, that of the placenta remarkably increased. Though ChE levels in the brain and placenta of pregnant rats were reduced by oral administration of 10 mg/kg of leptophos, ChE levels in the fetus were not affected. ATP content in rat mothers was remarkably reduced by administration of leptophos. Leptophos inhibited oxidative phosphorylation of mitochondria *in vitro* . These findings suggest a relationship between fetal leptophos toxicity and abnormal maternal metabolic energy levels and the reduction of ChE in the placenta.

79-0882. Sei, K.; Matsumoto, N. (Sch. Public Health, Fac. Med., Univ. Tokyo, Tokyo, Japan) **[Effect of orally administered nicotine on intra-uterine growth of mice. Part 2.]** *Congital Anomiles (Senten Ijo)* 18(3): 167; 1978. (Japanese)

Groups of ICR-JCL pregnant mice were given, po, 6 mg/kg of nicotine nine times on odd-numbered days during 18 days of gestation or 6 mg/kg of nicotine four times on odd-numbered days from the second week of gestation for 18 days. Control groups were given either distilled water on the same schedules or were not treated. The results indicate no significant difference in fetal body weights of those administered with 6 mg/kg nicotine and those of the control groups. A significant difference was observed on the occurrence of external anomalies, such as open eyelids and cleft palates, between those treated for four times with nicotine and those treated with distilled water. No remarkable differences of fetal mortality in the different groups were observed. It is suggested that the action of nicotine in delaying intra-uterine fetal growth should be further studied including examination of skeletal specimens.

79-0883. Tarar, J. L.; Selpekar, C. R. (Bot. Dep., Inst. Sci., Nagpur 440001, India) **Effect of zinc phosphide (rodenticide) on soil algae.** *Curr. Sci.* 47(20): 789; 1978. (1 reference)

Zinc phosphide was applied at 0.2%, 0.4%, and 0.6% to soil to determine the effects on soil algae. After treatment with any concentration of zinc phosphide complete absence of the following algal species was noted: *Alphanothece stagnia, Aphanocapsa biformis, Lyngbya stagnina, Cylindrospermum musicola, Nostoc sphaericum, Anabaena attenuata, Anabaena spiroides, Anabaena oryzae, Calothrix bharadwajae, Calothrix elenkinii, Hapalosiphon welwitchii,* and *Westiellopsis prolifica.* The following species were not affected by the chemical: *Phormidium luvidum, Chlorococcum humicolo, Protococcus viridis,* and *Closterium* sp. Three genera, *Nostoc punctiforme, Chlorococcum vitiosum* and *Tabellaria* sp., were not affected by the lowest concentration, but each was destroyed at the higher two concentration. *Anabaena sphaerice* was removed from soil only at the highest concentration.

79-0884. Greig, J. B.; Osborne, G. (Toxicol Unit, Med. Res. Counc. Lab., Carshalton, Surrey, England) **Changes in rat hepatic cell membranes during 2,3,7,8-tetrachlorodibenzo-*p*-dioxin intoxication.** In: *Dioxin: Toxicological and Chemical Aspects.* Cattabeni, F., Cavallaro, A., Galli, G., eds. (Spectrum Publ., Inc.: NY) Chapter 10: 105-111; 1978. (17 references)

Female albino rats given 200 μg/kg TCDD in a single oral dose developed changes in hepatic parenchymal cells within 24 hr of dosing. Alterations in the metabolism of various substrates of the microsomal function oxidases, and changes in the plasma membranes of the hepatic parenchyma cells take place. Centrilobulae loss of ATPase activity after 3 days, drastically reduced K^+/Mg^{+2} ATPase activity after 6 days, and presence of giant multi-nucleate cells in the centrilobular zone after 4 wk were observed. It is possible that the initial disturbance of the oxidative enzymes of the endoplasmic reticulum leads to alterations in endogenous lipid metabolism. These changes may induce hepatic insufficiency, resulting in systemic toxic effects.

79-0885. Greenlee, W. F.; Poland, A. (Dep. Pharmacol. & Toxicol., Sch. Med. & Dent., Univ. Rochester, Rochester, NY) **TCDD: A molecular probe for investigating the induction of aryl hydrocarbon hydroxylase.** In: *Dioxin: Toxicological and Chemical Aspects.* Cattabeni, F., Cavallaro, A., Galli, G., eds. (Spectrum Publ., Inc.: NY) Chapter 11: 113-122; 1978. (13 references)

The ability of TCDD to induce δ-aminolevulinic acid synthetase (ALAS) and aryl hydrocarbon hydroxylase (AHH) are investigated. ALAS and AHH induction by TCDD is closely linked with its lethal, teratogenic, and acnegenic potency. A macromolecular hepatic cytosol species which binds TCDD reversibly, stereospecifically, and with high affinity has been identified from rats and mice. This cytosol species has many of the properties predicted for the hypothesized receptor for the induction of AHH, including the capacity of dibenzo- *p*-dioxin inducers of AHH activity to displace specifically bound ^{3}[H]-TCDD *in vitro.*

79-0886. Matthiaschk, G. (Bundesgesundheitsamt, Berlin, Germany.) **Survey about toxicological data of 2,3,7,8-tetrachloro dibenzo-*p*-dioxin (TCDD).** In: *Dioxin: Toxicological and Chemical Aspects.* Cattabeni, F., Cavallaro, A., Galli, G., eds., (Spectrum Publ. Inc.: NY) Chapter 12: 123-136; 1978. (49 references)

A literature review of the acute and subacute toxicity of TCDD, its metabolism, mutagenicity, and teratogenicity are presented. Oral LD50 values ranged from 0.6 g/kg in male guinea pigs to 120 g/kg in mice and rats. Pathological effects of TCDD toxicity include the "chick edema disease" of poultry, and lymphoid organ atrophy and liver dysfunction in several mammalian species. Fetal cleft palates, hydronephrosis, and absence of eyelids are among the teratogenic effects. Neither *in vitro* or *in vivo* tests involving mammalian models were mutagenic, but TCDD-induced high mutagenic frequencies were found in *Salmonella typhimurium.*

79-0887. McConnell, E. E.; Moore, J. A. (NIEHS, Research Triangle Park, NC) **The toxipathology of TCDD.** In: *Dioxin: Toxicological and Chemical Aspects.* Cattabeni, F., Cavallaro, A., Galli, G., eds., (Spectrum Publ., Inc.: NY) Chapter 13: 137-141; 1978. (19 references)

Chemical and pathological manifestations of TCDD ingestion in various laboratory animal species are discussed. 2,3,7,8-TCDD LD50-30 values are much lower than any other chlorinated dioxin compounds investigated. Of the animal species compared, the guinea pig is the most sensitive to TCDD (LD 50-30 2 μg/kg), and females of all species are more susceptible. Clinical signs of TCDD intoxication include anorexia and weight loss, puffiness of eyelids, facial alopecia and acne-like eruptions, and edema of the lips. Hematological and clinical chemistry findings are indicative of debilitation. Pathological findings include loss of body fat, involution of the thymus, and testicular alterations in some species. Hepatic lesions are notable in rodents but not in monkeys or guinea pigs. Other lesions, found in monkeys, involve the stomach, duodenum, bile duct and ureter/urinary bladder.

79-0888. Neal, R. A.; Beatty, P. (Cent. Environ. Toxicol., Dep. Biochem., Sch. Med., Vanderbilt Univ., Nashville, TN) **Influence of enzyme induction on TCDD toxicity.** In: *Dioxin: Toxicological and Chemical Aspects.* Cattabeni, F., Cavallara, A., Galli, G., eds. (Spectrum Publ., Inc: NY) Chapter 14: 143-155; 1978. (13 references)

LD50 studies (ip injections for 20 days) in the rat indicate that TCDD is more toxic to females (24.6 μg/kg) and weanling males (25.2 μg/kg), than to adult males (60.2 μg/kg). Castration of adult males leads to a decrease in hepatic cytochrome P450 monooxygenase and an increase in TCDD toxicity (LD50 39.1 μg TCDD/kg). Female rats treated with testosterone, or weanling males pre-treated with phenobarbital, and TCDD showed increased resistance to toxicity. The toxicity of TCDD is inversely related to the activity of the hepatic cytochrome P450 containing monooxygenase system. The activities of NADPH and NADH diaphorase enzymes were found to increase after injection of TCDD, but the role of these flavoproteins is uncertain.

79-0889. Saint-Ruf, G. (Cent. Marcel Delepine, CNRS, F-45045 Orleans, France) **The structure and biochemical effects of TCDD.** In: *Dioxon: Toxicological and Chemical Aspects.* Cattabeni, F., Cavallaro, A., Galli, G., eds., (Spectrum Publ., Inc.: NY) Chapter 15: 157-162; 1978. (12 references)

Among the dibenzo-*p*-dioxins, only 3 halogenated derivatives (TCDD, TBrDD, and HCDD) show significant toxic, teratogenic, and enzyme inductive properties. TBrDD and TCDD, are important inducers of aryl hyroxylase (AHH), oxazolamine hydroxylase, and ALAS enzyme systems, Electronic environments of these two compounds are similar, and their three-dimensional geometry is almost identical. There appears to be a close relationship between biological properties and molecular structure.

79-0890. Vos, J. G.; Kreeftenberg, J. G.; Kater, L. (Natl. Inst. Public Health, Bilthoven, The Netherlands) **Immune suppression by TCDD.** In: *Dioxin: Toxicological and Chemical Aspects.* Cattabeni, F., Cavallaro, A., Galli, G., eds. (Spectrum Publ., Inc.: NY) Chapter 16: 163-175; 1978. (19 references)

Groups of 5 nursing SPF Swiss-Webster mice received 0 or 10 μg/kg body wt TCDD postnatally on days 1, 4, 8, 11, 15, and 18. Groups of 2 pups also received sc injections of high (50 μg) or low (15 μg) doses of calf thymosin for 1 wk. These doses were doubled and tripled during wks 2 and 3, respectively. Body and thymus weights of pups exposed to TCDD plus high or low doses of thymosin were significantly reduced from control groups receiving neither ($p \leq 0.001$), or from groups receiving TCDD alone ($p \leq 0.025$). In the presence of 50 μg/kg TCDD, mice treated with 10, 100, or 500 μg endotoxin (*E. coli,* LPS) suffered mortalities 40, 80, and 100%, respectively, a marked increase in susceptibility over controls. Thymosin treatment does not appear to prevent thymus atrophy. The increased suscpetibility of TCDD-treated animals to infections may be due to suppression of thymus-dependent or cell-mediated immunity.

79-0891. Schmidt, R. P. (Kansas State Univ. Agric. & Appl. Sci., Manhattan, KS 66506) **Effects of Sevin insecticide on susceptibility of domestic turkeys to histomoniasis.** *Diss. Abstr. Int. B.* 39(5): 2083; 1978.

The first experiment emphasized the importance of simultaneous and increasing dosage of Sevin (carbaryl or 1-naphthyl N-methyl carbamate) and *Histomomas* in turkeys. If the number of *Histomonas* administered was constant, the dosage of carbaryl was not significant, and the presence or absence of *Histomonas* was the key and determining factor for causing pathology. When increasing dosages of carbaryl and *Histomonas* were applied simultaneouly, their combined effects were sufficient to increase the pathogenicity. In no instance did synergism occur between carbaryl and *Histomonas.* The second experiment indicates that a single, large

dose is significantly more pathogenic than partitioned, single doses which finally equal the large dose. In the case of partitoned, daily dose, the liver of the turkeys expels 90% of the carbaryl administered within 2-5 days. The third experiment showed that the time of carbaryl application does not significantly influence the final level of pathogenicity of *Histomonas* infections as detected by the GOT readings. The fourth experiment suggested that the presence of carbaryl may increase the pathogenicity of *in vitro* injected histomonads. All prior studies showed reduced pathogenicity after *in vitro* cultivation and reinjection. The carbaryl apparently counteracted the reduced pathogenicity of the *in vitro* histomonads. The fifth experiments demonstrated that *in vitro* culture of *Histomonas* with carbaryl is a reasonable and reliable indicator of the *in vivo* environment in the turkey host. Carbaryl augmented the growth and reproduction of *Histomonas* at concentrations of 10-30 ppm. In summarizing the five (5) experiments which involved turkeys, the researcher noted that carbaryl augmented the pathogenicity of *Histomonas* infections. However, synergism between carbaryl and *Histomonas* does not occur. (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms, order No. 7821887.)

79-0892. Ali, S. (Univ. Illinois, Urbana-Champaign, IL) **Degradation and environmental fate of endosulfan isomers and endosulfan sulfate in mouse, insect and laboratory model ecosystem.** *Diss. Abstr. Int. B.* 39(5): 2117; 1978.

Endosulfan (Thiodan) is an organochlorine insecticide which is used extensively in agriculture. This study is an attempt to evaluate its environmental quality and biodegradability by using metabolism study data from an insect, mouse and a laboratory model ecosystem, and by using certain intrinsic molecular properties such as water solubility, partition coefficent and photodecomposition. Further, the cause of ecological magnification was understood by the uptake study data. It was found that all food chain organisms of the ecosystem study interconverted the two isomers and particularly oxidized the α-isomer to the corresponding sulfate which was then concentrated into the body tissues. In the mouse, endosulfan lactone was found to be the major metabolite which was excreted in large quantities both in feces and urine. No endosulfan or endosulfan sulfate was detected in the muscle, kidney, liver and visceral fat after 10 days of administration of endosulfan or endosulfan sulfate. Fish concentrated more endosulfan sulfate when exposed to the α-isomer and a good linear relationship was found between the extent of concentration and the time of exposure. It is suggested that ecological magnification of endosulfan sulfate in fish and snail is mainly due to the direct uptake from the water. Endosulfan is found to be more water soluble than many of the organochlorine insecticides and the partition coefficient is also less. Endosulfan decomposes rapidly in water solution under light in contrast to many other organochlorine insecticides. (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms, Order No. 7820891.)

79-0893. Lund, A. E. (Purdue Univ., West Lafayette, IN) **The mode of action of formamidine pesticides in mammals and insects.** *Diss. Abstr. Int. B* 39(5): 2122; 1978.

The mechanism of toxic action of the insecticide/acaricide chlordimeform (CDM) in mammals and the mechanism by which formamidines afford plant protection against lepidopterous pests were investigated. In the first part of this study, the cardiovascular actions of CDM were compared to those of lidocaine. In dogs anesthetized with pentobarbital, CDM (3-30 mg/kg) caused dose dependent hypotensive responses which resulted from direct myocardial depression and peripheral vasodilation, neither of which were affected by denervation or pharmacological manipulation. This depressor reponse was followed by a centrally-mediated pressor response, which was an autonomic component of the CDM-induced seizures, and was blocked by sympatholytics and by diazepam. At higher doses, (50-75 mg/kg), CDM caused simultaneous respiratory arrest, that could not be prevented by artificial respiration, and irreversible hypotension. Comparable effects were observed following lidocaine (1-20 mg/kd). These results indicate that CDM toxicity in mammals is due largely to actions that are shared by local anesthetic agents. It is concluded that plant protection is afforded by a non-lethal mechanism which probably arises from motor stimulation through actions on non-cholinergic junctions and not by a local anesthetic mechanism as was found for mammals. (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms, order No. 7821471.)

79-0894. Mallipudi, N. M. (Univ. California, Riverside, CA) **Toxicity and mode of action of *N*-sulfenylated derivatives of insecticidal methylcarbamate esters in the honey bee.** *Diss. Abstr. Int. B* 39(5): 2123; 1978.

A series of *N*-sulfenyl and *N*-aminosulfenyl derivatives of several commercial insecticidal methylcarbamate esters were examined for toxicity to honey bees and house flies. All but one of the compounds tested showed high toxicity to the honey bee. This exceptionally nontoxic compound was 2-iso propoxy- *N*-methyl- *N*-(2- methyl- 4-*t*-butyl phenylsulfenyl) carbamate (sulfenyl-propoxur) (LD50 > 800 μ g/g). This compound was greater than 33 times more toxic to house flies (LD50 24.5 μg/g). The parent carbamate, propoxur, was more toxic to the honey bee (LD50 4.5 μg/g) than to house flies (LD50 24.5 μg/g). The toxicitiy of sulfenyl-propoxur to honey bees was enhanced greater than 18.2 fold by the synergist piperonyl butoxide. The penetration and metabolism of sulfenyl-propoxur was examined in the house fly and honey bee. Reduced penetration was found to be a factor in the lower toxicity of sulfenyl-propoxur to the honey bee. Honey bees and house flies metabolized sulfenyl-propoxur qualitatively in a similar manner. Quantitatively, larger amounts of propoxur were found in the house fly than in the honey bee soon after treatment with sulfenyl-propoxur. This decrease in *in vivo* conversion of sulfenyl-propoxur to its active toxic parent carbamate, propoxur, was considered as another factor responsible for its low toxicity to bees. The

high susceptibility of bees to propoxur was related to high internal amounts of unchanged propoxur found soon after treatment. (Author abstract by permission. Copies of the thesis available from University Microfilms, order No. 7821361.)

79-0895. Solomon, H. M. (Rutgers State Univ. New Jersey, Newark, NJ) **The teratogenic effects of the insecticides DDT, carbaryl, malathion and parathion on developing medaka eggs (*Oryzias latipes*).** *Diss. Abstr. Int. B* 39(5): 2176-2177; 1978.

Medaka eggs were exposed to 1 ppb ^{3}H-DDT after fertilization, for periods of 3, 6 or 8 days. The eggs were then fixed and the separated chorions, yolks and embryos were weighed and counted for radioactivity. Small amounts of ^{3}H-DDT entered the eggs and became incorporated into the embryonic tissue, but were not teratogenic. Concentrations of carbaryl between 0.5 and 20.0 ppm, malathion between 5.0 and 40.0 ppm and parathion between 1.0 and 18.0 ppm were added to dishes containing 10 newly fertilized eggs and 10 ml of embryo rearing solution. Abnormalities detected by daily gross observations as well as prepared histological sections, included defects in heart morphology, edema, irregular heart beat, clots in the intra- and extraembryonic blood vessels and backwards flow of blood in the heart. In addition, malathion and parathion were effective in producing neuromuscular disorders and tail deformities. Many embryos with circulatory defects died before hatching, thus possible skeletal defects could not be recorded. Pulse-dose experiments using 10 ppm carbaryl were initiated on days 0-7 and lasted for 24 to 96 hr; no periods of sensitivity were observed. The highest percentages of circulatory anomalies occurred in groups which (a) were allowed to develop normally for the longest periods of time before exposure, and (b) which had been exposed to the insecticide for the greatest length of time (96 hr). Embryos, allowed to develop for 1-5 days before being exposed to 10 ppm carbaryl, and remaining in the insecticide until hatching or death, were still susceptible to the effects of carbaryl. These experiments show that the insecticide does not disrupt primary developmental events but rather affects cell physiology. In the last experiment combinations of malathion and carbaryl were administered to determine possible antagonistic, additive or synergistic effects. Twenty-five different concentrations of carbaryl ranging from 0.0 to 5.0 ppm and malathion ranging from 0.0 to 20.0 ppm were employed. At low concentrations slight syngersitic effects were revealed by statistical analysis. At higher concentrations additive and antagonistic effects were observed. (Author abstract by permission, abridged. Copies of the thesis available from University Microfilms, order No. 7818117.)

79-0896. Escobar, E. N. (Univ. Maryland, College Park Campus, MD 20742) **The effects of feeding diflubenzuron (TH 6040 or Dimilin) to sheep and swine on reproduction and growth.** *Diss. Abstr. Int. B* 39(6): 2584; 1978.

Breeding sheep were fed 100 ppm diflubenzuron in the diet, over a period of 7 to 8 mo beginning 4 wk before breeding and continuing until the lambs were weaned. Total feed was allotted to both control and treated sheep to supply calculated requirements for maintenance and pregnancy as appropriate. Feeding of diflubenzuron had no apparent effect on conception and did not significantly affect lambing rate or birth weight of lambs. In growth studies subsequent to weaning, lambs fed as much as 2550 ppm diflubenzuron in the diet were not adversely affected by such feeding as measured by average daily gain, feed intake and feed conversion. The range of diflubenzuron residue in muslce, liver, kidney and fat of treated ewes and rams was 0.05 to 0.26 ppm, 0.05 and 0.58 ppm, $<$ 0.05 to 0.33 ppm and 0.35 to 1.74 ppm respectively, for seven sampling dates covering 254 days of treatment. In milk samples collected at 0, 2, 4, 6, and 8 wk of lactation the residues of diflubenzuron ranged from $<$ 0.05 to 0.44 ppm. Gilts and boars were used to determine the effects of diflubenzuron at 100 ppm in swine diets. Weight gain during gestation and number of pigs per litter were higher ($P < 0.05$) for the sows fed diflubenzuron than for those fed the control diet. The birth weight of pigs was not affected ($P > 0.05$) by the experimental diets. In pig growth trials subsequent to weaning, diflubenzuron was fed at levels of 0.0, 12.5, 25.0, 100.0 and 250.0 ppm in the diet. None of these feeding levels affected ($P > 0.05$) average daily gain, feed conversion or the general health of the animals. The range of diflubenzuron residue in muscle, liver, kidney, back fat and renal fat of gilts and boars was $<$ 0.05 to 0.14 ppm, 0.08 to 2.30 ppm, 0.09 to 0.70 ppm, 0.11 to 0.56 ppm and 0.21 to 0.55 ppm respectively. Diflubenzuron, at levels 4-10 times higher than fly larvae control rates, did not result in any adverse effects in swine or sheep. (Author abstract by permission, abridged. Copies of the thesis available from University Microfilms, order No. 7823995.)

79-0897. Kadous, A. A. R. (Univ. Wisconsin, Madison, WI) **Chlorinated hydrocarbon insecticides: mode of action, resistance mechanism, and metabolism.** *Diss. Abstr. Int. B* 39(6): 2652; 1978.

On the basis of latency heptachlor epoxide was selected as the representative cyclodiene in which to study: (1) the biochemical mode of action in rat, and (2) the mechanism of resistance to dieldrin in German cockroaches. Mode of action was investigated using rat brain nerve component: synaptosomes, synaptic vesicles and microsomes. It was found that heptachlor epoxide stimulated uptake of calcium ions in nerve endings, particularly by the synaptic vesicle fraction. Such stimulatory action would cause an increased release of neurotransmitter substance. These data are in agreement with previous electrophysiological evidence by others on the action mechanism of these types of compounds. Relative to the studies on the resistance mechanism, invesitgations were carried out on various ATPase systems from nerve ending fractions of dieldrin-resistant and susceptible strains of the German cockroack. (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms, order No. 7815418.)

79-0898. Westlake, G. E.; Bunyan, P. J.; Stanley, P. I. (Pest. Infest. Control Lab., Minist. Agric. Fish. & Food, Tolworth, Surbiton, Surrey KT6 7NF, England) **Variation in the response of plasma enzyme activities in avian species dosed with carbophenothion.** *Ecotoxicol. Environ. Saf.* 2(2): 151-159; 1978. (20 references)

Studies were conducted on the response of plasma enzyme activity of various avian species to carbophenthion ingestion. Birds used in the study were Japanese quail, pigeons, chickens, and species of geese. Dosages ranged from 25 to 250 mg/kg. Both males and females were tested, and all birds except the quail (6-wk-old) were adults. The enzymes GOT, GDH, and SDH were assayed in blood samples and homogenized liver tissues. Treated Japanese quail exhibited increased levels of GOT and GDH which were proportional to the dose. A rapid distinct species response was exhibited by the other species. The geese and pigeons responded within 3 hr, but the chickens responded more slowly.

79-0899. Muller, W. F.; Hobson, W.; Fuller, G. B.; Knauf, W.; Coulston, F.; Korte, F. (Inst. Oekol. Chem. Gesselsch. Strahlen. & Umweltforsch. mbH, Munich, BRD) **Endocrine effects of chlorinated hydrocarbons in rhesus monkeys.** *Ecotoxicol. Environ. Saf.* 2(2): 161-172; 1978. (10 references)

Studies were peformed to determine the effects of HCB (hexachlorobenzene) and PCB on the hormonal systems of sexually mature rhesus monkeys and rats. It was seen that 4 mg/kg/day of PCB blocked ovulation in three of the four monkeys; HCB blocked ovulation in one of four monkeys. Low estrogen levels were caused by both compounds, but luteinizing and follicle stimulating hormones (LH and FSH) did not change. Ovarian steroid production by rats was reduced by 20 mg/kg of HCB.

79-0900. Loose, L. D.; Pittman, K. A.; Benitz, K. F.; Silkworth, J. B.; Mueller, W.; Coulston, F. (Inst. Comp. & Human Toxicol., Albany Med. Coll., Union Univ., Albany, NY 12208) **Environmental chemical-induced immune dysfunction.** *Ecotoxicol. Environ. Saf.* 2(2): 173-198; 1978. (67 references)

Studies were performed on the antibody production capabilities of mice when subjected to PCB and HCB (hexachlorobenzene). Test chemicals were mixed in the diet at 167 or 5 ppm. Immune responses to malarial infection and sheep RBC antigens were measured. Treated mice subjected to sheep RBC antigens demonstrated about half the response of the control group. Serum IgA was 40-80 mg/dl lower for both PCB and HCB groups. Treated mice also demonstrated a 31% reduced resistance to malaria.

79-0901. Lehotzky, K.; Szeberenyi, J.; Ungvary, Gy. (Munic. & County Public Health Inst., Budapest, Hungary) **Dimefox hatasa az idegvezetesi sebessegre es a kolineszteraz aktivitas alakulasara patkanyokon. [Effect of dimefox on the nerve conduction velocity and cholinesterase activity in rats.]** *Egeszsegtudomany* 22(3): 253-259; 1978. (31 references) (Hungarian)

The effect of Terra systam (dimefox; acute oral LD50 in rats: 5.59 mg/kg) on the motor conduction velocity (MCV) of the tail nerve and on whole-body cholinesterase activity was studied in rats in acute (2.8 mg/kd po) and subacute (0.10 and 0.25 mg/kg/day) poisoning tests for 6 wk. In the acute posioning tests, dimefox caused dose-dependent cholinesterase inhibition; it developed rapidly, and persisted for a fairly long time. The MCV showed an over 50% decrease 24 hr after poisoning; this decrease was accompanied by a marked elevation of the stimulus threshold. The animals were symptom-free in the subacute experiments, but the whole-blood cholinesterase activity was inhibited by about 40% in the animals treated with 0.10 mg/kg/day doses, and by about 70% in those treated with 0.25 mg/kg/day doses. The inhibition rate was totally independent of the total dose administered. The MCV was significantly reduced in both groups, but the stimulus threshold of the evoked muscular potential remained unchanged. The light and electron micrograms of the sciatic nerve showed no difference from the control. The cause and mechanism of the change in the MCV is yet unknown.

79-0902. Selypes, A.; Nehez, M.; Paldy, A.; Nagymajtenyi, L.; Berencsi, Gy. (SZOTE, Szeged, Hungary) **Paraquat *in vivo* cytogenetikai hatasanak vizsgalata egeren. [Study of *in vivo* cytogenetic effect of paraquat in mice.]** *Egeszsegtudomany* 22(3): 277-280; 1978. (26 references) (Hungarian)

The mutagenic effect of paraquat, administered by different routes, was studied in CFLP male mice. One group inhaled paraquat spray generated from a 1% aqueous solution for 15 min, corresponding to a dose of 0.25 mg/kg. Two other groups were treated orally (60 mg/kg and 12 x 2.40 mg/kg). Four other groups received ip injections (1 x 15 mg/kg, 2 x 5.50 mg/kg, 2 x 2.75 mg/kg, or 5 x 0.55 mg/kg). Gaps and isogaps were found in 5-8% of the bone marrow cells analyzed, versus 6% in cells from untreated controls. There was no significant difference from the controls. The findings indicate the absence of mutagenicity of paraquat.

79-0903. Molnar, J.; A. Paksi, K. (Munic. & County Public Health Inst., Budapest, Hungary) **Dinamikus inhalacios berendezes novenyvedoszerek porinhalacios vizsgalatara kis allatokon. [Dynamic inhalation device for the dust inhalation study of plant-protecting agents in small animals.]** *Egeszsegtudomany* 22(3): 285-287; 1978. (5 references) (Hungarian)

Experimental pesticide dust inhalation device for the study of inhaled pesticides on small laboratory animals is described. The device consists of an inhalation chamber and a dust hopper with ball-chain feeder. The dust entrained by the balls is removed by compressed air, and blown into the inhalation chamber. The dust concentration in the chamber can be varied by changing the ball-chain motor speed. It is possible to maintain stable concentrations ranging from 0.136 to over 6 g/m^3. The inhalation chamber accomodates up to 16 animals.

79-0904. Roush, R. T. ; Hoy, M. A. (Dep. Entomol. Sci., Univ. California, Berkely, CA 94720) **Relative toxicity of permethrin to a predator, *Metaseiulus occidentalis*, and its prey, *Tetranychus urticae*.** *Environ. Entomol.* 7(2): 287-288; 1978. (14 references)

Two strains of the two-spotted spider mite, *Tetranychus urticae*, were 20-40 times more tolerant to permethrin than 3 strains of the phytoseiid *Metaseiulus occidentalis*. One predator colony was 2 times more susceptible to permethrin than the other two. The authors note that very low rates of permethrin might preserve *M. occidentalis* populations in the field. (Author abstract by permission.)

79-0905. Kolaja, G. J.; Hinton, D. E. (Comp. Pathol. & Surg. Branch, Vet. Med. Div., Chem. Syst. Lab., Aberdeen Proving Ground, MD.) **Ultrastructural alterations in the eggshell gland epithelium of the mallard duck after chronic exposure to DDT.** *Environ. Pollut.* 17(3): 237-244; 1978. (17 references)

Adult female mallard ducks ingested DDT (50 ppm in their daily feed) for 5 mo. One mo after the induction of egg production, they were sacrificed and eggshell glands were fixed for electron microscopic examination. Observations disclosed edema of ciliated epithelial cells and vacuoles in the endoplasmic reticulum. It was concluded that the reduced thickness of eggshells observed in DDT-exposed fowl is caused by a reduction in calcium transport, which is mediated by the epithelial cells.

79-0906. Preissig, S. H.; Abou-Donia, M. B. (Dep. Pathol., Med. Cent., Duke Univ., Durham, NC 27710) **The neuropathology of leptophos in the hen: a chronologic study.** *Environ. Res.* 17(2): 242-250; 1978. (18 references)

Recent investigations into a possible association between exposure to leptophos and neurological symptoms in insecticide factory workers makes study of the neurological effects of leptophos in the experimental situation particularly important. The present study utilizes a single oral dose of 200 mg/kg of leptophos in 20 chickens which are sacrificed in pairs to define the temporal sequence of changes in the sciatic nerve, its major branches, and the spinal cord and to correlate these findings with the clincial symptoms of the animals. At this dose leptophos produces degeneration of the spinal cord in a pattern similar to that seen with tri-*o*-cresyl phosphate (TOCP). The ataxia seen in these birds is probably due to the posterior and lateral column involvement. At this dose, onset of paralysis correlates roughly with both the degeneration of the anterior descending tract of the spinal cord and degeneration of the peripheral nerve. The minimal degree of nerve involvement suggests that the cord lesion is more significant at this dose in the hen. Using TOCP, spinal cord lesions predominate in the hen while the peripheral nervous system appears more sensitive in the human and non-human primate. Assuming that leptophos resembles TOCP in this regard, peripheral nerve damage would be the expected earliest change, especially in the low-dose situation in the human. (Author abstract by permission of Academic Press)

79-0907. Meerbach, V. W.; Grabner, R. (Inst. Allg. Pathol. & Pathol. Anat., Erfurt, BRD) **Lungenveranderungennach experimenteller Paraquat applikation. [Lung alterations after paraquat posioning.]** *Exp. Pathol.* 16(1-6): 168-179; 1978. (59 references) (German)

Studies were performed to determine the effects of paraquat on the lungs of adult hooded rats. A dose of 35 mg/kg body wt paraquat was injected and examinations were made 2, 4, 8, 16, 24, and 48 hours post injection. Granulocytes occured in the interstitium and alveolar space initially, followed by lymphoid elements and histiocytes after 8 hours. After 24-48 hours, the alveolar epithelium degraded. The pV curves showed a significantly reduced hysteresis loop.

79-0908. Kozik, M. B.; Wigowska-Sowinska, J. (49 Przybyszewskiego Str., P-60355 Poznan, Poland) **Cerebral changes in the course of intoxication with mercury phenylacetate.** *Exp. Pathol.* 16(1-6): 267-275; 1978. (17 references)

Studies were performed to determine the cerebral changes in Wistar rats following intoxication by phenylmercury acetate (PMA). One group received intragastric single daily doses of 0.1 g for 10 days. The second group received 0.05 g for 30 days. Cerebral ATPase, acP and AChE activities decreased. TPPase and NsChE activities increased. Neuronal vacuolization and spongious degeneration of white matter were observed. The observations were made on both groups, but the extent of the changes was dependent upon the duration of exposure.

79-0909. Pis'ko, G. T.; Tolstopyatova, G. V.; Zholdakova, Z. I.; Korshun, M. N.; Borisova, E. V.; Gudz', O. V.; Kamenetskaya, T. V. (Author address not given.) **Obosnovanie predel'no dopustimoi kontsentratsii 2-oksi-3,6-dikhlor-benzoinoi kisloty v vode vodoemov. [Substantiation of the maximum allowable concentration of 2-hydroxy-3,6-dichlorobenzene (herbicide metabolite) in reservoir water.]** *Gig. Sanit.* 43(10): 95-96; 1978. (6 references) (Russian)

The toxicological and hygienic characteristic of 2-oxy- 3,6-dichloro benzoic acid, and a metabolite of banvel-D (dicamba) were investigated to substantiate a maximum allowable concentration in bodies of water. The odor threshold was found to be 0.54 mg/l. In a concentration of 0.5 mg/l, it reduced the biological oxygen demand by 17-30%. The acute oral LD50 was found to be 1560 mg/kg in rats, and 660 mg/kg in albino mice. Weak cumulative effect was observed. Chronic poisoning tests were performed with daily doses of 0.03-3 mg/kg in albino rats for 6 mo. Significantly increased blood catalase level, increased cholinesterase level in the brain, blood and liver, reduced blood peroxidase activity, reduced oxygen pressure in the skeletal muscles, and reduced hepatic glycogen content were seen in the group treated with the highest dose. Less marked changes were seen in the group treated with 0.3 mg/kg doses, and there were no changes at all in the group treated with 0.03 mg/kg doses, corresponding to 0.6 mg/l. The findings indicate that the maximum allowable concentrations of 2-oxy-3,6-dichloro benzoic acid should be set at 0.5 mg/l in bodies of water.

79-0910. Orecchio, F.; Ficarra, M. G.; Villa, P.; Sciarra, M. (Ist. Ig. Univ. Cattol. S. Cuore, Rome, Italy) **Azione biologica dei ditiocarbamati: Effetto su alcuni sistemi enzimatici. Nota I. Variazioni della fosfatasi alcalina, della leucino-aminopeptidasi (LAP) e della gamma-glutamiltranspeptidasi plasmatica (γGT), nel coniglio dopo trattamento con tetrametiltiourambisolforo (TMTD). [Dithiocarbamate effects on enzymatic systems. I. Plasma alkaline phosphatase, leucine aminopeptidase (LAP) and gamma-glutamyl transpeptidase (γ-GT) levels in rabbits after tetramethylthiuram disulfide (TMTD) treatment.]** *Ig. Mod.* 71(7): 915-922; 1978. (18 references) (Italian)

The effects of treatment with low doses of TMTD (thiram) (1 mg/kg/day for 15 days ig, then 100 mg/kg ip on the 20th day) on the serum alkaline phosphatase (AP), LAP and γ-GT activities were studied in nine male White New Zealand rabbits. The treatment caused significant reduction of the enzyme activities. The LAP activity was 13.25 mU/ml on day 7 and 7.20 mU/ml on day 23, versus 16.6 mU/ml before the treatment. The γ-GT activity was 4.04 mU/ml on day 7, 0.00 mU/ml on days 15 and 21, and 2.76 mU/ml on day 28, versus an initial value of 2.97 mU/ml. The AP activity averaged 41.32 mU/ml on day 7, 15.84 on day 23, and 18.72 mU/ml on day 28, versus 47.08 mU/ml before the treatment. The findings indicate the great value of these enzymes in the assessment of the toxic effects of dithiocarbamates in general and of their hepatotoxic effects in particular.

79-0911. Dikshith, T. S. S.; Nath, G.; Datta, K. K. (Ind. Toxicol. Res. Cent., Lucknow 266001, India) **Combined cytogenetic effects of endosulfan and metepa in male rats.** *Indian J. Exp. Biol.* 16(9): 1000-1002; 1978. (19 references)

Twenty albino rats were maintained on ad libitum pellet diets. Various groups of the animals were administered orally with either peanut oil, endosulfan (11.6 mg/kg/day), metepa (13.6 mg/kg/day) or combinations of endosulfan and metepa in peanut oil for a 30 day period. No significant chromosomal changes were observed in the rats. Chromosomal breaks and fragments noted in the bone marrow cells of the endosulfan treated rats were comparable to those found in the control groups. Metepa, however, produced more chromatid breaks in bone marrow than in spermatogonial cells. This was true when the chemical was given alone or in combination with endosulfan. The mitotic index was more highly significant in spermatogonial cells than in bone marrow. These findings indicate the absence of potentiation when endosulfan and metepa were administered jointly.

79-0912. Rao, V. S. N.; Krishnaiah, K. S.; Sreeraman, P. K.; Rama Rao, P. (Dep. Pharmacol. & Toxicol., Coll. Vet. Sci., Tirupati 517502, India) **Effect of oral DDT in male rats.** *Indian J. Exp. Biol.* 16(9): 1002-1003; 1978. (4 references)

Mature male colony bred albino rats received DDT as suspension in 1 ml of 1% wt/vol of gum saline orally in daily doses of 2 and 6 mg/kg for an 8 wk period. No signs of toxicity or behavioral abnormalities were noted during this period. Pentobarbital sleeping times were significantly lowered among DDT-treated animals, but there was no dose dependent decrease. Liver weights were considerably increased in rats fed at the 2 mg/kg rate. In animals fed at the 2 and 6 mg/kg rates, the weights of testes were increased, as well as being grossly enlarged and edematous. No gross or histological changes were noted in any other organ. The significant reduction in pentobarbital sleeping times noted in DDT-treated animals indicates that drug metabolizing enzyme induction had occurred in liver tissues.

79-0913. Somasundaram, K.; Damodaran, V. N.; Venkitasubramanian, T. A. (Dep. Pathol. Vallabhbhai Patel Chest Inst., Univ. Delhi, Delhi 110007, India) **Biochemical changes following absorption of dieldrin through skin.** *Indian J. Exp. Biol.* 16(9): 1003-1004; 1978. (23 references)

Various concentrations of dieldrin were applied to the skins of animals and the subsequent effects on the animals noted. A significant increase in hepatic RNA and protein was noted in deldrin-treated guinea pigs. DNA concentrations were not changed. Biochemical changes were noted in all treatment groups, ranging from concentrations of dieldrin applied at 0.0001% to 0.1%. Lower concentrations of 0.001 to 0.002% did not cause significant histopathological changes, but the chemical was still absorbed and stored.

79-0914. Sundaram, K. S.; Damodaran, V. N.; Venkitasubramanian, T. A. (Dep. Pathol., Vallabhbhai Patel Chest Inst., Univ. Delhi, Delhi 110007, India) **Absorption of dieldrin through skin.** *Indian J. Exp. Biol.* 16(9): 1004-1007; 1978. (19 references)

Dieldrin was dissolved in ethyl acetate at a concentration varying from 0.0001 to 0.1% and then applied to the skin of guinea pigs. The concentrations of 0.0001 to 0.002% closely rememble concentrations used in mothproofing woolen garments. At higher concentrations, 0.01 to 0.1%, the animals tolerated fewer applications; with high mortality observed early in the study. The rate of weight loss was 10 to 20% in animals exposed to concentrations of 0.1%, and 2-6% in animals exposed at lower concentrations. Lungs were congested at the low concentrations and both lungs and liver were congested as well as there being evidence of skin changes at the high concentrations. The skin became brittle after repeated applications of high concentrations (0.01 to 0.1%) dieldrin. Collagen fibers of the dermis became loosely arranged. No such changes were seen at the lower concentrations. No significant changes were seen in organ weights. The dieldrin content was higher in animals treated with higher doses, but the increase was not proportional to the dose.

79-0915. Cabral, J. R. P.; Mollner, T.; Raitano, F.; Shubik, P. (Eppley Inst. Res. Cancer, Univ. Med. Cent. Nebraska, Omaha, NE 68105) **Carcinogenesis of hexachlorobenzene in mice.** *Int. J. Cancer* 23(1): 47-51; 1979. (15 references)

Hexachlorobenzene (HCB) was mixed in the diets of female and male outbred Swiss mice. HCB concentrations varied from 50 to 300 ppm. A shortened life span was noted

after the 30th wk in mice receiving 200 or 300 ppm HCB. Tremors and convulsions were also noted in these animals. A reduction in growth rate was noted in female groups receiving 50, 200 and 300 ppm and a more pronounced growth retardation was noted in males receiving 100, 200, or 300 ppm. Tumors most frequently observed in both treated and untreated mice were lymphomas and lung adenomas, while liver-cell tumors appeared only in HCB-treated animals. The results of this study indicate the carcinogenic effect of HCB in mice.

79-0916. Clark, D. E.; Ivie, G. W.; Crookshank, H. R.; DeVaney, J. A.; Bull, D. L. (Vet. Toxicol. & Entomol. Res. Lab., USDA, College Station, TX 77840) **Effects of sulprofos and its sulfoxide and sulfone metabolites on laying hens fed the compounds in the diet.** *J. Agric. Food Chem.* 27(1): 103-107; 1979. (8 references)

The organophosphate insecticide sulprofos (Bolstar, BAY NTN 9306, *O*-ethyl *O*-[4-(methylthio)phenyl] S-Propyl phosphorodithioate) and its sulfoxide and sulfone metabolites were added to the diet of White Leghorn laying hens as a 2:5:3 mixture of sulprofos/sulfoxide/sulfone. At the highest treatment level (150 ppm), the treated diet was apparently highly unpalatable, and feed consumption was greatly reduced; loss of weight and drop in egg production resulted. At treatment levels of 50 ppm or lower in the diet, these effects were reduced or nonexistent. Serum cholinesterase (ChE) activities were significantly decreased in birds fed diets containing as little as 2.7 ppm of the insecticide mixture, but ChE activity increased quickly after the birds were transferred to untreated feed. Analysis of tissues and eggs from birds maintained on the treated diet for 28 days showed no detectable residues ($<$ 0.05 ppm) of sulprofos or its intact ester metabolites, except in skin and fat of some of the birds fed at the highest treatment level. Histopathological examination of selected tissues from the treated birds showed no lesions. (Author abstract reprinted by permission of the American Chemical Society.)

79-0917. Feroz, M.; Khan, M. A. Q.* (Dep. Biol. Sci., Univ. Illinois Chicago Circle, Chicago, IL 60680) **Fate of [^{14}C]photoheptachlor in rabbits.** *J. Agric. Food Chem.* 27(1): 108-113; 1979. (24 references)

Tissue distribution, elimination, and metabolism of intraperitoneally administered photoheptachlor was studied in male rabbits. Biological half-time of the compound at 0.8 mg/kg dose level was about 70 days. The radioactivity was excreted almost exclusively in urine. Analyses of the urine extracts revealed that all the radioactivity was in the form of four metabolites, none of which corresponded to the parent compound. Gas chromatography-mass spectrometry analysis of one of the metabolites indicates that this metabolite arises by oxidative dechlorination of photoheptachlor and is eliminated both in free and conjugated form. Tissue distribution indicated that maximal amounts of the radiocarbon were present in visceral fat and the residues declined with the passage of time. (Author abstract reprinted by permission of the American Chemical Society.)

79-0918. Akhtar, M. H.; Foster, T. S. (Anim. Res. Inst., Agric. Canada, Ottawa, Ont. K1A 0C6, Canada) **Comparative in vitro metabolism of tetrachlorvinphos by the soluble fraction (105000 *g*) from sheep, pig, and cow liver homogenates.** *J. Agric. Food Chem.* 27(1): 113-116; 1979. (8 references)

The organophosphorus insecticide tetrachlorvinphos was incubated with the soluble fraction (105000 *g*) from homogenates of sheep, pig, and cow livers. Dealkylation to a water-soluble metabolite desmethyl tetrachlorvinophos by a reduced glutathione dependent enzyme system was the major route of degradation. The rate of dealkylation followed the order cow=sheep > pig. The water-soluble metabolite was further metabolized very effectively by the enzyme system in the soluble fraction. The metabolites 2,4,5-trichloro phenacyl chloride, 2,4,5-trichloro acetophenone, 1-(2,4,5- trichloro phenyl) ethanol, and 2-chloro-1- (2,4,5-trichloro phenyl) ethanol were positively identified. The rate of production of these metabolites did not vary greatly between species. (Author abstract reprinted by permission of the American Chemical Society.)

79-0919. Richter, E.; Lay, J. P.; Klein, W.; Korte, F. (Pharmakol. Inst., D-8000 Munich 2, BRD) **Enhanced elimination of Kepone-^{14}C in rats fed liquid paraffin.** *J. Agric. Food Chem.* 27(1): 187-189; 1979. (9 references)

Twelve male rats were fed a diet containing 3.3 ppm Kepone-^{14}C (^{14}C-chlordecone) for 3 days. After 1 day on the control diet, six animals received a ration containing 8% light liquid paraffin for 24 days. The remaining six animals served as control. Paraffin-treated rats excreted signficantly more radioactivity with feces (61%) compared to controls (52%) and had significantly lower concentrations of radioactivity in 14 of 18 tissues analyzed. Excretion of radioactivity with urine was of minor importance (0.5-0.6%) in both groups. (Author abstract reprinted by permission of the American Chemical Society.)

79-0920. Hassan, H. M.; Fridovich, I. (Dep. Biochem., Med. Cent., Duke Univ., Durham, NC 27710) **Superoxide radical and the oxygen enhancement of the toxicity of paraquat in *Escherichia coli*.** *J. Biol. Chem.* 253(22): 8143-8148; 1978. (21 references)

The presence of oxygen increased the toxicity of paraquat to *Escherichia coli*. Paraquat toxicity was minimized in yeast extract added to a simple glucose-salts medium. Yeast extract also facilitated maximal induction of superoxide dismutase. Puromycin, an inhibitor of protein synthesis, prevented this induction and greatly increased the toxicity of paraquat. Paraquat lethality was entirely dependent on the presence of oxygen. An abundant supply of electrons was also essential for paraquat toxicity. Therefore, cells exposed in the absence of nutrients, or in the presence of nutrients to which they were not adapted, suffered only minimal lethality. It was concluded that paraquat was toxic and lethal to *E. coli* largely due to the fact that the chemical can be reduced within the cell and then reoxidized by molecular oxygen with the production of oxygen ions. Thus paraquat toxicity was largely

a superoxide toxicity and was lessened by superoxide dismutase.

79-0921. Deskin, R.; Rosenstein, L.; Rogers, N.; Westbrook, B. (Health Effects Res. Lab., US EPA, Research Triangle Park, NC 27711) **Parathion toxicity in perinatal rats born to spontaneously hypertensive dams.** *J. Environ. Pathol. Toxicol.* 2(2): 291-300; 1978. (29 references)

Parathion was given in peanut oil by oral gavage at doses of 0.01, 0.10, and 1.00 mg/kg/day to 90-day-old rats from day 1 of gestation through 15 days of the lactation period. While body weights showed an increase with increasing doses of parathion, there were significant increases particularly at the 1.00 mg/kg dose level. Heart weights were significantly reduced at doses of 0.01 mg/kg and above. Kidney weights were significantly reduced at the 1.00 mg/kg dose and relative ovary weights showed a significant decline at doses of 0.01 mg/kg and above. A significant increase in red blood cell counts was noted at 0.01 through 0.10 mg/kg dose levels, but not at the 1.00 mg/kg/day dose level. A dose-related increase in SGOT activity was seen at the 1.00 mg/kg dose level. CPK activity was significantly increased at 1.00 mg/kg. Male SHR perinates showed a significant recuction in both red blood cell and plasma cholinesterase activities at 1.00 mg/kg level. Female SHR perinates exhibited reduction in plasma cholinesterase activities at the 1.00 mg/kg dose and exhibited a numerical reduction in red blood cell cholinesterase with increased dose of parathion. Parathion caused no significant reduction in the number of pups born per litter, nor was survival rate affected to day 24 post partum.

79-0922. Biles, R. W.; Connor, T. H.; Trieff, N. M.; Legator, M. S.* (Div. Environ. Toxiol., Dept. Prevent. Med. & Community Health, Med. Branch, Univ. Texas, Galveston, TX 77550) **The influence of contaminants on the mutagenic activity of dibromochloropropane (DBCP).** *J. Environ. Pathol. Toxicol.* 2(2): 301-312; 1978. (22 references)

Technical grade DBCP was tested for mutagenic effects and found to be weakly mutagenic at concentrations of 50-1000 μg when assayed in *Salmonella typhimurium* TA1535, with and without S-9 activation, using agar overlay and dessicator procedures. Concentrations above 1600 μg were toxic. When the technical grade compound was purified by distillation, a more mutagenic substance was dectected in the early distilling fraction. The second distillate was less mutagenic than the first, but about the same as the parent technical grade compound. In direct *in vitro* evaluations, the mutagenicity of the technical grade DBCP was attributed almost entirely to the addition of the stabilizer, epichlorohydrin. However, DBCP also demonstrated significant genetic activity.

79-0923. Cranmer, J. S.; Avery, D. L.; Grady, R. R.; Kitay, J. I. (Dept. Pharmacol., Univ. Arkansas Med. Sci., Little Rock, AR 72201) **Postnatal endocrine dysfunction resulting from prenatal exposure to carbofuran, diazinon, or chlordane.** *J. Environ. Pathol. Toxicol.* 2(2): 357-369; 1978. (27 references)

Adult female F2 hybrid mice were exposed to a daily dose of 0.01 or 0.50 mg carbofuran/kg body weight, 0.18 or 9.00 mg/kg diazinon, or 0.16 or 8.00 mg/kg chlordane. All pesticide and control groups gave birth to about equal numbers of viable, overtly normal offspring. The mortality rate was 55% among offspring born to mothers receiving 8.00 mg/kg/day chlordane during the first week of lactation. Resting levels of plasma corticosterone were increased in females exposed to the lower dose of carbofuran. In male mice the adrenal function was not affected by exposure to 0.01 mg/kg/day carbofuran. However, a decrease was noted in total hepatic metabolism of corticosterone. Reductive capacity was decreased at the A-ring and side chain sites in females of the carbofuran exposed group. For animals exposed to diazinon at 0.18 mg/kg/day, plasma levels of corticosterone were elevated at rest, but response to stress was not affected. Exposure to diazinon at 9.00 mg/kg/day significantly reduced adrenal weight of both female and male mice. Exposure to chlordane at 0.16 mg/kg/day had no effect on adrenal function in females. Liver metabolism was not impaired except for a significant decrease in reduction at the side-chain site. Chlordane at 9.00 mg/kg did not effect adrenal or liver function in male or female mice.

79-0924. Donovan, M. P.; Schein, L. G.; Thomas, J. A.* (Dep. Pharmacol., Med. Cent., West Virginia Univ., Morgantown, WV 26506) **Effects of pesticides on metabolism of steroid hormone by rodent liver microsomes.** *J. Environ. Pathol. Toxicol.* 2(2): 447-454; 1978. (16 references)

Mature male Swiss-Webster mice and Sprague-Dawley rats were exposed to hepatachlor, methoxychlor, carbofuran, diazinon, and parathion at concentrations ranging from 10 n*M* to 0.1 m*M*. The ability of these pesticides to inhibit ^{3}H-testosterone metabolism was measured. Heptachlor and methoxychlor significantly inhibited hydroxylation reactions at 0.1 m*M*, but not at 1 μ*M*. Carbofuran stimulated formation at 16α-hydroxy testosterone and 6β-hydroxy testosterone when present at low concentrations. Organophosphates had mixed reactions. Diazinon inhibited 16α-hydroxylation at 0.1 m*M* to a greater extent than it reduced formation of the other hydroxysteroids. Parathion did not effect 16α-hydroxylation, but markedly reduced 7α- and 6β-hydroxylations at 0.1 m *M*. Similar effects were noted on hepatic microsomes from mice.

79-0925. Engst, R.; Macholz, R. M.; Kujawa, M. (Cent. Inst. Nutr., Acad. Sci. DDR, DDR-1505 Potsdam-Rehbrucke, DDR) **Metabolism of gamma-hexachloro cyclohexane (HCH) in vivo. Metabolism of orally administered gamma- 2,3,4,5,6-penta chlorocyclohexene (PCCH).** *J. Environ. Sci. Health B* 13(4): 425-427; 1978. (6 references)

A study of the metabolites of lindane derived compounds, formed in rat livers, was performed. Wistar rats were fed a standard diet with an additional 8 mg PCCH/kg body weight, applied by gavage. Rat liver extract chromatograms

confirmed the metabolism of PCCH to notable amounts of 1,2,3,5- and/or 1,2,4,5-TeCB (tetrachlorobenzene) and 1,3,5-TCB (trichlorobenzene).

79-0926. Leatherland, J. F.; Sonstegard, R. A. (Dep. Zool., Univ. Guelph, Guelph, Ontario N1G 2W1, Canada) **Lowering of serum thyroxine and triiodothyronine levels in yearling coho salmon, *Oncorhynchus kisutch*, by dietary mirex and PCBs.** *J. Fish. Res. Board Canada* 35(10): 1285-1289; 1978. (14 references)

Yearling coho salmon, *Oncorhynchus kisutch*, were fed diets conatamined with PCB's (500 μg or 50 μg/g dry feed), mirex (50 μg or 5 μg/g dry feed), or a mixture of mirex and PCB's (5 μg mirex + 50 μg PCB/g dry feed) daily for 2 or 3 mo. Serum T3 and T4 levels were significantly reduced in fish fed the high mirex diet for 2 or 3 mo. The significant increase in serum T4/T3 ratios in fish given the high mirex or high PCB diet was not evident in fish given the mixed mirex-PCB diet, suggesting a synergistic effect that is different from the effect of individual contaminants. Fish given the high PCB or high mirex diet had significantly lower body weights than the control fish. (Author abstract by permission)

79-0927. Kumar, D.; Muthu, M.; Kurien, S. (Cent. Food Technol. Res. Inst., Mysore 570013, India) **Effect of feeding methyl iodide fumigated groundnuts on growth of albino rats.** *J. Food Sci. Technology* 15(2): 76-77; 1978. (10 references)

Groundnuts were fumigated with methyl iodide at an effective dosage of 32 mg/l for 48 hr at 27.5°C. This treatment was followed by 2 wk aeration. The treated groundnuts contained 0.38 ppm of physically bound methyl iodide residue. The groundnuts were then incorporated into diets of 12 and 18% protein levels. Male albino Wistar rats were fed the diets for 2 mo. No pathological changes were noted in liver, kidney, or thyroid glands of rats receiving the fumigated groundnut diets. Histologically, the organs were normal. Testes of rats of the treated group were also normal. The study thus demonstrated that short term fumigation of groundnuts with methyl iodide will not likely produce toxic effects on either the growth or fertility of male albino rats. The nutritive value of the groundnuts was apparently unaffected by the treatment.

79-0928. Greenberg, D. B.; Lyons, S. A.; Last, J. A.* (Primate Res. Cent., Univ. California, Davis, CA 95616) **Paraquat-induced changes in the rate of collagen biosynthesis by rat lung explants.** *J. Lab. Clin. Med.* 92(6): 1033-1042; 1978. (26 references)

Sprague-Dawley male rats, free of chronic respiratory disease, were given injections of paraquat at a dose rate of 24 mg/kg. Paraquat-treated rats weighed 84% of controls. The collagen synthesis rate was found to increase dramatically after paraquat injection. This was measured as the synthesis of ^{3}H-hydroxyproline from ^{3}H-proline by lung minces. Paraquat adminsitration resulted in a fourfold increase in the apparent rate of collagen synthesis 3 days after injection. Hydroxyproline synthesis by tissue minces from either control or paraquat-treated rats was linear with time of incubation for up to 3 hr. The rate of hydroxyproline synthesis correlated well with the level of paraquat induced damage. Lungs of rats receiving 24 mg/kg paraquat were 25 to 50% hemorrhagic. The usefulness of the administration of high doses of paraquat to rats for studying alterations in collagen biosynthesis has been demonstrated.

79-0929. Cobby, J.; Mayersohn, M.*; Selliah, S. (Coll. Pharm., Univ. Arizona, Tucson, AZ 85721) **Disposition kinetics in dogs of diethyldithiocarbamate, a metabolite of disulfiram.** *J. Pharmacokinet. Biopharm.* 6(5): 369-387; 1978. (35 references)

Male dogs were anesthesized and a drug solution of sodium diethyldithiocarbamate trihydrate was infused into the cephalic vein. The disposition kinetics of diethyldithiocarbamate (DDC) were subsequently studied. The solutions contained 9.87 mg/ml DDC anion. Of the administered dose, about 27% was *S*-methylated, showing a first-order rate constant mean of 0.0569/min. The remainder of the dose was eliminated by other routes having a rate constant of 0.148/min. An elimination rate constant of 0.0141/min was noted for the methyl diethyldithiocarbamate formed from DDC.

79-0930. Griffin, D. E., III; Hill, W. E. (Dep. Microbiol., Univ. Southwestern Louisiana, Lafayette, LA 70504) **In vitro breakage of plasmid DNA by mutagens and pesticides.** *Mutat. Res.* 52(2): 161-169; 1978. (35 references)

Covalently closed circular molecules of the colicinogenic plasmid E1 can serve as sensitive indicators for detecting in vitro breakage of DNA. After these molecules are radioactively labeled and purified by cesium chloride density-gradient centrifugation, they are incubated with the compounds to be tested. Samples are analyzed on alkaline sucrose gradients to determine the fraction of unbroken molecules and a breakage rate is calculated. Positive results were obtained for all three mutagenic alkylating agents (MMS, EMS, and MNNG) and of the 11 pesticides tested, dexon (fenaminosulf), dichlorvos, malathion, and methyl parathion induced breaks in molecules at a rate significantly greater than the controls. (Author abstract by permission)

79-0931. Yoshikawa, K. ; Uchino, H.; Kurata, H. (Dep. Microbiol., Natl. Inst. Hyg. Sci., Tokyo, Japan) **Differential mutagenicity of *N*-methyl- *N*-nitrosocarbamate insecticides in *Escherichia coli* strains having different DNA repair capacities.** *Mutat. Res.* 54(3): 283-288; 1978. (7 references)

Four isogenic strains of *Escherichia coli* with the same auxotrophic marker (*arg* Fam — namely wild-type, *uvr* A-, *pol*A-, and *rec*A-) were used for testing the lethalities and mutagenicities of 1-naphthyl N-methyl- N-nitrosocarbamate (nitroso-NAC), 3-methylphenyl N-methyl- N-nitrosocarbamate (nitroso-MTMC), and 3,4-dimethylphenyl N-methyl-

N-nitrosocarbamate (nitroso-MPMC). The strains *rec*A- and *pol*A- showed a similarly higher sensitivity to killing than wild-type and *uvr*A- after treatments with each of the three chemicals, whereas the strains wild-type, *uvr*A-, and *pol*A- were equally mutable by these compounds at equal doses. The strain *rec*A- was hardly mutable by nitroso-NAC, but significant levels of Agr+ mutations were observed after treatments with nitroso-MTMC and nitroso-MPMC. These and previous results suggest that both nitroso-MTMC and nitroso-MPMC are similar in their mutagenicity pattern to N-methyl- N'-nitro- N-nitrosoguanidine whereas nitroso-NAC is similar to methyl methanesulfonate or x-rays, and that the major damage to DNA of the three agents is not excisable by the *uvr*A+- dependent excision repair, probably methylation in DNA. (Author abstract by permission)

79-0932. Swietlinska, Z.; Zuk, J. (Inst. Biochem. & Biophys., Polish Acad. Sci., P-02532 Warsaw, Poland) **Cytotoxic effects of maleic hydrazide.** *Mutat. Res.* 55(1): 15-30; 1979. (120 references)

A review of findings on maleic hydrazide (MH) is presented. In early works the inhibitory effects of MH on plant growth were mainly considered to result from the suppresion of plant metabolism (inhibiton of enzymic activity) and interference of the compound with plant hormones and growth regulators. More recently, numerous experiments performed with various plant species have shown that MH acts as an inhibitor of the synthesis of nucleic acids and proteins. Similar results have been obtained with animal tumor cells. The chromosome-breaking effect of MH on plant chromosomes resembles very closely the chromosome-breaking properties of alkylating agents and other mutagenic compounds such as mitomycin C. MH-induced chromosomal aberrations have also been recorded in grasshoppers, fish and mice, although tests with some mammalian cell lines gave negative results. Among higher plants, selective sensitivity to the toxic effects of MH is well proved. This phenomenon seems to be due to the differential ability of various plant species to detoxicate the chemical. Plants can break down MH into several products, one of which, hydrazine, is a well-known mutagen and carcinogen. MH does not seem to be toxic to bacteria and fungi. The compound is degraded by soil microflora and hence can be utilized as a source of nitrogen. MH proved to be of low toxicity to mammals, but in some instances it decreased the fertility of rats. The reported carcinogenic effects of MH in mice and rats raise the question of its risks to man. (Author abstract by permission, abridged)

79-0933. Petropolis, P. N.; Kamra, O. P. (Lab. Radiat. Biol., Dalhousie Univ., Halifax, Nova Scotia, Canada) **Cytotoxic effects of toximul MP8 in human lymphocytes in culture: a preliminary investigation.** *Mutat. Res.* 58(2-3): 287-291; 1978. (12 references)

Toximul MP8, a commercial emulsifier formulation, has been used for a number of years to spray forest trees infested with spruce budworm with the organophosphate insecticides, fenitrothion and phosphamidon. To assess its cytotoxic effects on human lymphocytes varying amounts of toximul MP8 were added to human whole blood (0-50 ppm) and cultured along with phytohaemagglutinin for 52 hr. At the end of the culture period cytotoxicity to human lymphocytes was assessed by (1) mitotic index, (2) DNA labelling index and (3) the frequency of chromatid breaks. The cytotoxic effects were apparent even at the lowest concentration tested, i.e., 10 ppm. A significant dose-dependent decrease in the mitotic and DNA-labelling indices was observed. Toximul MP8 also produced a significant level of chromatid breaks even at 10 ppm. (Author abstract by permission)

79-0934. Seiler, J. P. (Swiss Fed. Res. Stn., CH-8820 Wadenswil, Switzerland) **Herbicidal phenylalkylureas as possible mutagens. I. Mutagenicity tests with some urea herbicides.** *Mutat. Res.* 58(2-3): 353-359; 1978. (16 references)

Substituted phenylaklylureas are widely used as herbicides. In the assay system of Friedman and Staub, which measures the inhibition of testicular DNA synthesis (DSI test), most of these substances showed a positive reaction, i.e. they depressed thymidine incorporation significantly. Bacterial tests demonstrated a weak mutagenic activity, too; but in the micronucleus test the compounds were almost inactive. As one member of this group of chemicals — the herbicide monuron — is a recognized carcinogen, these results seem to indicate a possible hazard, but more investigations are needed to quantify this danger. (Author abstract by permission)

79-0935. MacGregor, J. T.; Gould, D. H.; Mitchell, A. D.; Sterling, G. P. (West. Reg. Res. Cent., USDA, Berkeley, CA) **Mutagenicity tests of diflubenzuron in the micronucleus test in mice, the L5178Y mouse lymphoma forward mutation assay, and the Ames *Salmonella* reverse mutation test.** *Mutat. Res.* 66(1): 45-53; 1979. (25 references)

Diflubenzuron, one of a new class of pesticides believed to act via inhibition of chitin synthesis in the developing insect cuticle, was tested for possible mutagenic activity using the micronucleus test in mice, the L5178Y mouse lymphoma forward mutation test at the thymidine kinase lucus, and the Ames *Salmonella*/microsome reverse mutation test. No mutagenic effect was found. (Author abstract by permission)

79-0936. Kaukeinen, D. (Agric. Chem. Res. Cent., Goldsboro, NC) **Experimental rodenticide (Talon) passes lab tests; moving to field trials in pest control industry.** *Pest Control* 47(1): 19-21, 46; 1979.

In feeding tests using untreated EPA meal and EPA meal treated with Talon, rodents were apparently unable to detect the presence of the poison. Talon is superior to currently existing anticoagulant rodenticides due to its single-feeding effectiveness. Nearly 100% mortality has been achieved in about 600 mice and rats being exposed to single-feeding experiments. This high mortality has been achieved among all three commensal species and tests have shown it to be highly

palatable. Vitamin K_1 is antidotal at doses of 25 mg/kg for humans or non-target animals. The chemical can remain active after storage times of one year.

79-0937. Karel, A. K.; Saxena, S. C. (Toxicol. Lab., Dep. Zool., Univ. Rajasthan, Jaipur, India) **Chronic pyrethrum toxicity: effect on blood biochemistry of *Meriones hurrianae*, Jerdon, the Indian desert gerbil.** *Pyrethrum Post* 14(2): 49-52; 1977. (16 references)

Healthy adult male gerbils were exposed to 0.2 ml of 0.2% pyrethrum in petroleum ether by intramuscular injection in the thigh, every 3 days, for a period of 45 days. Animals were examined at intervals of 15, 30 or 45 days following treatment. Blood glucose was increased and serum proteins were decreased by the pyrethrum extract injection. An increase was noted in serum alkaline phosphatase activity. No effect was noted on serum acid phosphatase activity. It is suggested that hypoproteinemia as noted herein was due in part to the destruction, necrosis, or disturbance in the function of liver parenchyma, and in part to a reduction in food intake. Increased serum alkaline phosphatase activity was attributed to a degeneration and necrosis of liver parenchyma.

79-0938. Escoubet, P. (Fond. Sci. Ricard, Obs. Mer, Ile Embiez, Le Brusc, F-83140 Six-Fours-les-Plages, France) **Effets du lindane sur des cultures d'algues phytoplactoniques marines et sur des coques: resultats preliminaires. [Effects of lindane on cultures of marine phytoplanctonic algae and cockles. Preliminary results.]** *Rev. Int. Oceanogr. Med.* 49: 21-27; 1978. (14 references) (French)

The effects of lindane on two marine phytoplankton species, *Pavlova (Monochrysis) lutheri* and *Dunaliella primolecta*, and on the cockle *Cerastoderma glaucum* were studied in concentrations of 2.5-10 ppm. Of the two algal species, *P. lutheri* was found to be more resistant to lindane than *D. primolecta*. While concentrations of 7.5 ppm and higher were necessary to cause considerable growth inhibition of *P. lutheri*, a similar effect was achieved with concentrations of 2.5 ppm and higher in *D. primolecta*. The contaminated cells of *P. lutheri* were larger than the non-contaminated cells, and the contaminated cells of *D. primolecta* were smaller than the non-contaminated cells. The cockles, fed with contaminated cells of *P. lutheri* incubated with 2.5-10 ppm of lindane, showed increasing mortality with increasing lindane concentration during the first 5 days and after the 20th day of feeding.

79-0939. Anonymous **[Introduction of the recently registered pesticides methyldimlone and amiprophosmethyl herbicides.]** *Shokubutsu Boeki (Plant Prot.)* 32(11): 488-489; 1978. (Japanese)

The registered formulation of methyldimlone contains 50% of 1- (α, α- dimethylbenzyl) -3- methyl-3- phenylurea and is used for killing pre-germination weeds in lawns. The acute oral LD50 values of the active ingredient to male mice, female mice, male rats, and female rats were 7660, 6830, 8950, and 6130 mg/kg, respectively. The acute sc LD50 values to the above-mentioned animals are 10730, 7600, 11410, and 7810 mg/kg, respectively. The TLm value to carp is 15.3 ppm (48 hr). The registered formulation of amiprophosmethyl contains 60% of *O*- methyl- *O*- (2-nitro- 4-methylphenyl) *N*-isopropyl phosphoro amidothioate and is also used for killing pre-germination weeds in lawns. The acute oral LD50 values of the active ingredient to male mice, female mice, male rats, and female rats are 540, 552, 1100, and 1200 mg/kg, respectively. The acute ip LD50 values are over 1000 mg/kg for both mice and rats of both sexes. The acute dermal LD50 value to both sexes of mice is over 4000 mg/kg, and over 5000 mg/kg in rats of both sexes. The TLm value to carp is 1.9 ppm (48 hr).

79-0940. Anonymous **[Introduction of newly registered pesticides for agricultural use. Pyriminyl, a rodenticide and Herupos (trade name), a plant-growth regulating agent.]** *Shokubutsu Boeki (Plant Prot.)* 32(12): 530; 1978. (Japanese)

The rodenticidal preparation pyriminyl, contains 2.7% of *N*- (4-nitrophenyl)- *N*- (3-pyridylmethyl)- urea as the active ingredient. The preparation is granular, and recommended treatment for intoxication requires stomach wash. The acute oral LD50 values of the compound in dogs was found to be 98 mg/kg for males, and 68.7 mg/kg for females. In mice the oral LD50 values were found to range from 700 to 1000 mg/kg. The TLm (48 hr) to carp was over 100 ppm. The plant growth regulator Herupos (classified under class A) contains 0.5% of 6- (*N*-benzyl)- aminopurine as the active ingredient and is used for promoting the formation of lateral buds of roses and orchids. The acute oral LD50 values of the active ingredient in mice was found to be 2000 mg/kg for males, and 2400 mg/kg for females. In the rat the acute oral LD50 values were 2500 mg/kg for males, and 2100 mg/kg for females. The sc LD50 value to male mice was 1200, and to females, 1100 mg/kg. In rats the sc values were 480 and 690 mg/kg for males and females, respectively. The TLm (48 hr) to carp was 56 ppm.

79-0941. Rossouw, D. J.; Engelbrecht, F. M. (MRC Lung Metab. Res. Group, Dep. Physiol., Univ. Stellenbosch, Parowvallei, Cape Province, South Africa) **The effect of paraquat on the respiration of lung cell fractions.** *S. Afr. Med. J.* 54(28): 1101-1104; 1978. (14 references)

In concentrations of 0.1 m*M*, paraquat demonstrated no effect on the cyanide-insensitive oxygen consumption of either lung or liver homogenates prepared from male Sprague-Dawley rats or male New Zealand white rabbits. At higher concentrations, 1 m*M*, 5 m*M*, and 10 m*M*, an acute and significant increase in oxygen uptake was noted. When exposed to concentrations of up to 0.5 m*M*, no significant change was noted in state 3 respiration of lung mitochondria. Higher concentrations, however, of up to 1.0 m*M* significantly inhibited mitochondrial oxygen consumption. No species differences were noted concerning the effects of paraquat on oxygen consumption at the mitochondrial level. Over a time

period of 1 hr, paraquat at 1.0 m*M* did not effect mitochondrial respiration. However, such a concentration significantly inhibited mitochondrial oxygen consumption over a 2 hr incubation period. Significant inhibition of state 3 respiration was noted after a 4 hr exposure to 0.01 m*M* paraquat.

79-0942. Rossouw, D. J.; Engelbrecht, F. M. (MRC Lung Metab. Res. Group, Dep. Physiol., Univ. Stellenbosch, Parowvallei, Cape Province, South Africa) **The effect of paraquat on the aerobic metabolism of rabbit alveolar macrophages and lung fibroblasts.** *S. Afr. Med. J.* 55(1): 20-23; 1979. (18 references)

The viability of isolated rabbit alveolar macrophages was not dramatically affected by paraquat at a concentration of 2 m*M*. Even after experiencing totally anaerobic conditions for 40 min, almost 50% of the macrophages were still able to exclude eosin. Oxygen consumption was reduced to values well below 40% of controls by paraquat exposure. Over longer periods of time and higher concentrations of paraquat, the decrease in viability of macrophages became more evident and tended to increase markedly when glucose was present in the substrate. Paraquat at 1 m*M* or more caused marked depression in oxygen uptake over a period of time. For this parameter, the absence of glucose caused a greater inhibition. Control macrophages registered cyanide-insensitive respiration ranging from 5.7% to 6.5% of the total oxygen utilization. Concentrations of 1 m*M* and 10 m*M* paraquat induced a 230% and a 90% increase in respiration, respectively. Exposure of fibroblasts to paraquat concentrations of 1 nmol/1000 cells for 40 min still left viable fibroblasts with an oxyten uptake of 60-80% of controls.

79-0943. Khera, K. S.; Iverson, F. (Bur. Chem. Saf., New Res. Cent., Natl. Health & Welfare Canada, Ottawa, Ont. K1A OL2, Canada) **Toxicity of ethylenethiourea in pregnant cats.** *Teratology* 18(3): 311-313; 1978. (7 references)

Ethylenethiourea (ETU) was administered orally in single daily doses of 0, 5, 10, 30, 60 or 120 mg/kg to time-mated cats. Daily dosing was started on day 16 of gestation in all test groups and was discontinued on the appearance of toxicity signs (between days 27-34 of gestation) in the 120 mg/kg group and on day 35 of gestation in the remaining test groups. Signs of toxicity, observed at all dose levels except in the 5 mg/kg and control, were delayed in onset and characterized by progressive loss in body weight, ataxia, tremors and hind-limb paralysis. A number of cats died or were killed in a moribund condition in the 30, 60 and 120 mg/kg dose groups. Eleven of the thirty-five fetuses obtained from six cats killed in a moribund state (4 from the 30 mg/kg and 1 each from the 60 and 120 mg/kg groups) were malformed, with coloboma occurring in four fetuses, cleft palate in two, spina bifida in one and umbiical hernia in four fetuses. Incidences of abortion and non-pregnancy, both unrelated to the treatment, were found in all groups including the control. All surviving cats were necropsied on day 46 of gestation and fetuses were collected for teratologic evaluation. No clear evidence was found for teratogenicity of ETU in live fetuses. (Author abstract by permission)

79-0944. Jaskoll, T. F.; Maderson, P. F. A.; Weiner, B. E. (Biol. Dep., Brooklyn Coll., Brooklyn, NY 11210) **The differentiation of the columella in avian embryos treated with hadacidin with some observations on other skeletal abnormalities.** *Teratology* 18(3): 321-326; 1978. (19 references)

Single doses of *N*-formyl hydroxyaminoacetic acid (hadacin) were injected into chick embryos HH stages 5-30. Embryos surviving for 8+ days total incubation time were recovered and examined for gross and microscopically observable defects. Particular attention was paid to the development of the columella. Survival was only 20%, but a high incidence of cranio-facial and hind limb defects was observed in most age groups. While three categories of columella defect were observed, reflecting some degree of age dependency, this chondrogenic tissue is less susceptible to teratogenic action than other skeletal tissues. The types of columella defect observed are interpreted in the light of a model of cellular interactions in fenestra vestibularis differentiation presented previously. It is concluded that hadacidin produces abnormalities of skeletal differentiation by disrupting morphogenic, rather than the initiative phases of development of particular elements. (Author abstract by permission)

79-0945. Vasyukova, E. A.; Margolis, M. G.; Mal'kovich, V. K. (A. A. Vishnevskiy Cent. Mill. Clin. Hosp., USSR Defense Min., USSR) **Bolezn' i sindrom Itsekno-Kushinga. [Cushing's syndrome.]** *Ter. Arkh.* 50(11): 131-137; 1978. (49 references) (Russian)

The general clinical and therapeutic aspects of Cushing's syndrome and hormone-active adrenocortical tumors are reviewed. TDE (*o,p'* isomer) was found to be highly effective in the treatment of patients with Cushing's syndrome; it is more active and less toxic than non-purified TDE. Regression of the tumors and metastases, inhibition of steroidogenesis in the adrenal glands, and a sharp reduction of the rate of secretion of hydrocortisone, corticosterone, and other corticosteroids were observed during *o,p'*-TDE therapy. This drug sometimes has side-effects, including periodical headaches, vertigo, loss of appetite, emesis, epigastric pains, and somnolence or euphoria.

79-0946. Kobayashi, S. (Sch. Pharmacol., Fac. Med., Toho Univ., Tokyo, Japan) **[Synergism in pesticide toxicity. Part I. Quantitative determination method for synergistic action.]** *Toho Igakkai Zasshi (J. Med. Soc. Toho Univ.)* 25(4): 616-634; 1978. (32 references) (Japanese)

A quantitative method for the determination of the synergistic action of drugs was investigated. Several methods for detection of synergism used in various fields of biology were compared. The acute oral toxicity to mice of the combined pesticides EPN and malathion was studied as an example. It was found that Carpenter's formula was essentially the same as Finney's formula and Sun & Johnson's formula; however, Carpenter's formula was found to be the best among

them. A diagrammed expression of this formula coincided with the isobole theory so that the support which has not yet been found for the isobole theory was provided. According to Carpenter's formula, it was calculated that the combined administration of EPN and malathion in a ratio of 1:24 to mice showed an apparent synergism of acute oral toxicity with a coefficient of 2.8.

79-0947. Kobayashi, S. (Sch. Pharmacol., Fac. Med., Toho Univ., Tokyo, Japan) **[Synergism in pesticide toxicity. Part II. Acute oral toxicity of anti-ChE pesticides in mice.]** *Toho Igakkai Zasshi (J. Med. Soc. Toho Univ.)* 25(4): 635-649; 1978. (5 references) (Japanese)

The degree of synergism in 16 kinds of two-component combinations of commercially available insecticides was investigated using Carpenter's method for quantitatively detecting synergism. Positive synergism was rarely found among these combinations in acute oral toxicity to mice. It was found that the degree of synergism showed a wide variation with the change of ratio of EPN to malathion, with the maximal synergism observed when the ratio approached LD50 (EPN)/LD50 (malathion). Synergism was not observed in either the acute percutaneous toxicity of these insecticides to mice, or in acute toxicity to carp and *Oryzias latipes*. From these findings it was concluded that few pesticide combinations show synergism as clearly as the combination of EPN and malathion, and the possibiity of increased toxicity due to combined use of pesticides is presumably low when considering the ratio of combination, route of exposure to the combined pesticides, and the degree of exposure.

79-0948. Buynitzky, S. J.; Ware, G. O.; Ragland, W. L. (Poult. Dis. Res. Cent., Coll. Vet. Med., Univ. Georgia, Athens, GA) **Effect of viral infection on drug metabolism and pesticide disposition in ducks.** *Toxicol. Appl. Pharmacol.* 46(2): 267-278; 1978. (36 references)

The influence of duck hepatitis virus (DHV) on hepatic drug metabolism was investigated using adult mallard ducks. Mallard drakes were fed 900 ppm of DDT and were killed at various times over periods of 10 or 12 days. Pesticide analysis by electron-capture gas chromatography revealed an enhanced *in vivo* biotransformation of DDT in mallards infected with DHV 48 hr prior to feeding the DDT diet for 12 days. Concentrations of DDT were lower in the serum of infected ducks, while the concentration of the metabolite DDD (TDE) was significantly higher ($p < 0.001$) in the bile of infected ducks throughout the 12-day feeding trial. The ratio of biliary DDD to DDE increased steadily in both control and DHV-treated groups, but was significantly higher ($p < 0.01$) among the virus-treated birds indicating a preferential induction of the microsomal dechlororeductase activity which produces DDD. Microsomal enzyme activities were generally higher in the virus-treated birds fed DDT than in noninfected controls fed DDT. The differences were most pronounced by day 8 when the activities of all three enzymes were higher at the $p < 0.05$ level. (Author abstract by permission)

79-0949. Kociba, R. J.; Keyes, D. G.; Beyer, J. E.; Carreon, R. M.; Wade, C. E.; Dittenber, D. A.; Kalnins, R. P.; Frauson, L. E.; Park, C. N.; Barnard, S. N.; Hummel, R. A.; Humiston, C. G. (Toxicol. Res. Lab., Health & Environ. Res., Dow Chem., Midland, MI 48640) **Results of a two-year chronic toxicity and oncogenicity study of 2,3,7,8-tetrachloro dibenzo-*p*- dioxin in rats.** *Toxicol. Appl. Pharmacol.* 46(2): 279-303; 1978. (9 references)

Rats were maintained for 2 yr on diets supplying 0.1, 0.01, and 0.001 μg of 2,3,7,8- tetrachloro dibenzo-*p*- dioxin (TCDD)/kg/day. Analysis of these diets indicated 2200, 210, and 22 parts per trillion (ppt) of TCDD. Ingestion of 0.1 μg/kg/day caused an increased incidence of hepatocellular carcinomas and squamous cell carcinomas of the lung hard palate/nasal rubinates, or tongue, whereas a reduced incidence of tumors of the pituitary, uterus, mammary glands, pancreas, and adrenal gland was noted. Other indications of toxicity at these dose levels included increased mortality, decreased weight gain, slight depression of erythroid parameters, increased urinary excretion of prophyrins and δ-aminolevulinic acid, along with increased serum activities of alkaline phophatase, γ-glutamyl transferase and glutamic-pyruvic transaminase. Gross and histopathologic changes were noted in the hepatic, lymphoid, respiratory, and vascular tissues. The primary hepatic ultrastructural change at this high dose level was proliferation of the rough endoplasmic reticulum. Terminal liver and fat samples from rats at this high dose level contained 24,000 and 8100 ppt of TCDD, respectively. Rats given 0.01 μg/kg/day for 2 yr had a lesser degree of toxicity than that seen at the highest dose level. This included increased urinary excretion of prophyrins in females, liver lesions (including hepatocellular nodules), and lung lesions (including focal alevolar hyperplasia). Terminal liver and fat samples from rats of this dose level contained 5100 and 1700 ppt of TCDD, respectively. Ingestion of 0.001 μg of TCDD/kg/day (approx 22 ppt in the diet) caused no effects considered to be of any toxicologic significance. At this lower dose level, terminal liver and fat samples each contained 540 ppt of TCDD. These data indicate that continuous doses of TCDD sufficient to induce severe toxicity increased the incidence of some types of tumors, while reducing other types. During the 2-yr study in rats, no increase in tumors occurred in those rats receiving sufficient TCDD to induce slight or no manifestations of toxicity. (Author abstract by permission)

79-0950. Yoshida, T.; Neal, R. A. (Cent. Environ. Toxicol., Dep. Biochem., Vanderbilt Univ. Sch. Med., Nashville, TN 37232) **Effect of ethylene bis diisothio cyanato sulfide (EBIS) on mouse liver δ-aminolevulinic acid synthetase.** *Toxicol. Appl. Pharmacol.* 46(2): 339-352; 1978. (52 references)

Ethylene bis diisothiocyanato sulfide (EBIS), a breakdown product of the ethylene bis dithiocarbamate fungicides, is an effective inhibitor of δ-aminolevulinic acid (ALA) synthetase when administered *in vivo* to mice. EBIS also inhibits the 3,5- dicarbethoxy- 1,4-dihydro- 2,4,6-trimethyl pyridine (DDC)-mediated induction of ALA synthe-

tase when administered 16 or 1 hr prior to, simultaneous with, or 1 hr subsequent to the administration of DDC. EBIS also inhibits the DDC-mediated induction of ALA synthetase when administered 3 hr after the administration of DDC. However, the degree of inhibition is diminished compared to prior administration or simultaneous administration of EBIS with DDC. The EBIS-mediated inhibition of ALA synthetase does not appear to be by way of a generalized inhibition of protein or RNA synthesis since EBIS induces rather than inhibits hepatic tyrosine aminotransferase activity. These data suggest that the inhibition of hepatic cytochrome P450 monooxygenase activity and the decrease in cytochrome P450 concentrations seen on administration of EBIS to rats or mice is the result of inhibition of ALA synthetase leading to a deficiency in the heme moiety required to synthesize holo-cytochrome P450. (Author abstract by permission)

79-0951. Bursian, S. J.; Edens, F. W.* (Dep. Poultry Sci., North Carolina State Univ., Raleigh, NC 27650) **The effect of acute carbaryl administration on various neurochemical and blood chemical parameters in the Japanese quail.** *Toxicol. Appl. Pharmacol.* 46(2): 463-473; 1978. (26 references)

Carbaryl, a carbamate insecticide which functions primarily as a cholinesterase inhibitor, has been shown to cause alterations in other general neurochemical parameters as well as blood chemical parameters. The present study examines more specificaly the effects of a cholinesterase inhibitor on catecholaminergic components within the central and peripheral nervous systems and addresses the idea of a possible relationship between altered neuronal activity and the hormonal activity of the Japanese quail. The injection of carbaryl (30 mg/kg) caused a significant inhibition of acetylcholinesterase activities in the telencephalon and medulla oblongata at 2 hr postinjection but did not affect cerebellum and diencephalon acetylcholinesterase activities. Carbaryl had no effect on endogenous concentrations of regional brain norepinephrine or on its turnover. Endogenous telencephalon dopamine concentrations were significantly elevated at 24 hr postinjection but dopamine turnover was not altered. Carbaryl caused a significant elevation of cardiac norepinephrine concentrations at 48 hr postinjection as well as an increase in cardiac norepinephrine turnover. Endogenous adrenal catecholamine concentrations were not affected by carbaryl administration, yet adrenal catecholamine turnover was accelerated. Plasma glucose and cholesterol concentrations were not altered by the injection of carbaryl. The results indicate that carbaryl has a subtle effect on the neurochemical integrity of the central and peripheral nervous systems of the Japanese quail. (Author abstract by permission)

79-0952. Williams, B.; Dring, L. G.; Williams, R. T. (Dep. Biochem., St. Mary's Hosp. Med. Sch., London W2 1PG, England) **The fate of triphenyllead acetate in the rat.** *Toxicol. Appl. Pharmacol.* 46(3): 567-578; 1978. (23 references)

Triphenyllead acetate labeled with ^{14}C or ^{3}H in the benzene rings or with ^{203}Pb has been synthesized and its fate in the rat has been partially elucidated. The compound is about 30 to 50 times more toxic to rats intraperitoneally than orally. Given orally (25 or 200 mg/kg) or intraperitoneally (2 mg/kg) most of the lead is excreted in the feces (up to 76% in 7 days). Sixty-five to eighty percent of the label of orally administered tri [^{14}C] phenyllead acetate (25 mg/kg) is eliminated in 6 days, with 26, 27, or 21% occurring in the urine, feces, and expired air, respectively. The ^{14}C in the urine was partially identified as quinol monosulfate (2%) and phenylsulfate (13%), that of the feces as unchanged triphenyllead acetate (4.5%), and that of the expired air as benzene (20%) and CO_2 (1%). After an intraperitoneal injection of tri [^{3}H] phenyllead acetate (2 mg/kg), 77% of the ^{3}H was eliminated in 14 days, with 20, 51, and 7% being in the urine, feces, and expired air, respectively. The ^{14}C in the urine collected after 3 days contained quinol monosulfate ($< 1\%$) and phenylsulfate (3%). Significant quantities of ^{3}H appeared in the feces only on the third day, while after 4 days 25% of the dose was in the feces and half of this was unchanged triphenyllead acetate. About 1 to 2% of the dose was identified as benzene in the expired air. Following an intraperitoneal injection of ^{203}Pb- or ^{3}H-labeled triphenyllead acetate into bile duct-cannulated rats, about 4% of the ^{203}Pb and 1.5% of the ^{3}H was excreted in the bile in 1 day. In 4 days 7% of the ^{3}H appeared in the bile. These results and studies of the stability of the compound under various conditions suggest that triphenyllead acetate is partially decomposed in the gut by nonenzymatic mechanisms. This would account in part for the greater toxicity of the compound when administered by the ip route compared with the oral route. (Author abstract by permission)

79-0953. Goldstein, J. A.; Friesen, M.; Scotti, T. M.; Hickman, P.; Hass, J. R.; Bergman, H. (Environ. Biol. & Chem. Branch, NIEHS, Research Triangle Park, NC 27709) **Assessment of the contribution of chlorinated dibenzo- *p*-dioxins and dibenzofurans to hexachlorobenzene- induced toxicity, porphyria, changes in mixed function oxygenases, and histopathological changes.** *Toxicol. Appl. Pharmacol.* 46(3): 633-649; 1978. (30 references)

Female rats were fed 30, 100, 300 and 1000 ppm of pure and technical grades of hexachlorobenzene (HCB) for 1 wk and 30, 100, and 300 ppm of each for 4 mo. Technical HCB was contaminated with 200 ppm decachlorobiphenyl and 4 ppm octachloro dibenzofuran but contained no other chlorinated dibenzofurans or dibenzo -*p*- dioxins (< 0.5 ppm). Pure HCB contained 0.5 ppm decachlorobiphenyl but no detectable amount of any chlorodibenzo -*p*- dioxins. Pure and technical HCB increased aryl hydrocarbon hydroxylase, aminopyrine *N*-demethylase, cytochrome P450, glucuronyl transferase, and liver/body weight ratios comparable at each dose level. Neither grade of HCB shifted the peak of the CO-difference spectrum or altered the 455:430 ratios of the ethyl isocyanide difference spectra appreciably. Livers, lungs, adrenals, and hearts were evaluated histologically. Enlargment of liver cells was seen at 100 and 300 ppm HCB. Marked hypertrophy and proliferation of the lining endothelial cells of the smaller pulmonary blood vessels was observed in rats fed 100 and 300 ppm HCB. At 100 ppm, the

number of affected vessels was usually greater in rats fed technical HCB than in those fed pure HCB. At 300 ppm, the pulmonary effects of pure and technical HCB were identical. The porphyria, cutaneous lesions, hyperexcitability, changes in liver enzymes, and morphological changes in the liver were identical in rats fed pure and technical HCB at all dose levels, indicating that these changes were produced by HCB, rather than chlorinated dibenzofuran or dibenzodioxin contaminants. (Author abstract by permission)

79-0954. Hanzlik, R. P.; Vyas, K. P.; Traiger, G. J. (Dep. Med. Chem., Univ. Kansas, Lawrence, KS 66045) **Substituent effects on the hepatotoxicity of thiobenzamide derivatives in the rat.** *Toxicol. Appl. Pharmacol.* 46(3): 685-694; 1978. (35 references)

Thiobenzamide has been found to produce dose-dependent increases in three biochemical indexes of hepatic injury in rats, plasma bilirubin, plasma glutamic pyruvic transaminase, and hepatic triglyceride content. The totoxicity of thiobenzamide was greatly altered by the addition of para substituents to the ring. Thus by all three biochemical indexes *p*- methoxy thiobenzamide was markedly more toxic than thiobenzamide, and conversely *p*-chloro thiobenzamide markedly less so. Benzonitrile, *p*- anisonitrile, and *p*- chlorbenzonitrile, which are anticipated metabolites of the thioamides, were found to have no significant hepatotoxicity. However, after phenobarbital pretreatment, thiobenzamide caused a fourfold rise in transaminase activity, and SKF 525-A produced a modest decrease in transaminase activity as well as significant decreases in plasma bilirubin and hepatic triglyceride content. Thus, as with other toxic thione-containing compounds such as thiourea and thioacetamide, metabolic activation appears to be an important aspect of the toxicity of thiobenzamide. (Author abstract by permission)

79-0955. Brestkin, A. P.; Godovikov, N. N. (Inst. Heteroorg. Comp., USSR Acad. Sci., Moscow, USSR) **Kombinirovannyi vid ingibirovaniya kholinesteraz fosfororganichemskimi soedineniyami. [Combined type of cholinesterase inhibition by organophosphorus compounds.]** *Usp. Khim.* 47(9): 1609-1627; 1978. (44 references) (Russian)

Studies on the combined inhibition of acetylcholinesterase and butylcholinesterase by organophosphorus compounds (diphenyl thiophosphonic acid esters, thioesters of phenyl thiophosphonic, cyclohexyl thiophosphonic, benzylphosphonic and dialkyl thiophosphoric acids) are reviewed. It was demonstrated that this type of inhibition is substantially determined by the presence of hydrophobic substituents in the molecules of the organophosphorus compounds. This type of inhibition can be due not only to the unproductive sorption of the inhibitor on the enzyme, but also to the presence of an enzyme-inhibitor complex in the enzymatic hydrolysis. Combined inhibition is caused mainly by the hydrophobic substituents in the phosphorylating part of the molecule of the cholinesterase inhibitor, but there are also compounds, e.g., benzhydryl esters of various thio acids of pentavalent phosphorus, in which such inhibition is due to the effect of substituents contained in the splitting-off part of the compound.

79-0956. Pevzner, L.; Balashova, E. K.; Kruglova, E. E.; Rozengart, V. I.; Sherstobitov, O.; Abduvabakhov, A. A. (I. M. Sechenov Inst. Evol. Physiol. & Biochem., USSR Acad. Sci., Leningrad, USSR) **Vnutrikletochnoe raspredelenie fosfororganicheskikh ingibitorov kholinesterazy v mozge krys. [Intracellular distribution of organophosphorus inhibitors of cholinesterase in rat brain.]** *Vopr. Med. Khim.* 24(6): 758-762; 1978. (12 references) (Russian)

The intracellular distribution of three organophosphorus cholinesterase inhibitors with the formula RO (CH_3) P(O) SC_2 H_4SC_2 H_5 (with R being C_2H_5: GD-7; C_4H_9: GA-59; or C_7H_{15}: GA-73) was studied in the brain of rats 15 min after the i.m. administration of equitoxic doses (5 nmoles/g of GD-7, 0.45 nmole/g of GA-59, and 200 nmoles/g of GA-73). The hydrophobicity of the compounds increased in the order GD-7, GA-59, GA-73. The percentages found for GD-7 were 12.5% in the cell nuclei, 6.9% in the mitochondria, 14.2% in the microsomes and 66.1% in the supermicrosomal fraction. The percentages of GA-59 were 20.8% in the nuclei, 24.2% in the mitochondria, 20.8% in the microsomes, and 25% in the supermicrosomal fraction. Thirty-eight per cent GA-73 was found in the nuclei, 25.6% in the mitochondria, 14.8% in the microsomes, and 8.4% in the supermicrosomal fraction. When a homogenate of supermicrosomal fraction was incubated with GA-59 or GA-73 at 37°C, no additional inhibition of the brain cholinesterase was observed, which is indicative of a considerable reduction of the free organophosphorus inhibitor content compared with the quantity extractable with chloroform.

79-0957. Kuz'minskaya, U. A.; Bersan, L. V.; Veremenko, L. M. (Lab. Biochem., All-Union Sci. Res. Inst. Hyg. & Toxicol. Pestic. Polymers & Plastic. Mat., Kiev, USSR) **Aktivnost' indikatornykh fermentov subkletochnykh strukter pecheni pri dlitel'nom vvedenii valeksona. [Activity of the indicator enzymes in the subcellular liver structures during long-term administration of valexon.]** *Vopr. Pitan.* (5): 48-51; 1978. (12 references) (Russian)

The effect of long-term oral treatment with valexon (phoxim; 31 and 3.1 mg/kg/day for 1-3 ot 6 mo) on subcellular liver enzyme activities was studied in male albino rats. The doses administered correspond to 0.05 and 0.005 of LD50, respectively. Treatment with 31 mg/kg/day doses for 1 mo caused a significant increase in the free SDH activity (from 7.55 μmoles/min/g in the controls to 8.79 μmoles/min/g, $p > 0.05$), of the glucose-6-phosphate dehydrogenase activity and of the unprecipitated glucose-6-phosphatase activity (from 0.721 to 1.569 mg p/g), and a reduction of the hexolinase activity (from 322 to 175 nmoles/min). After 6 mo of treatment the unprecipitated SDH activity was sharply increased (from 0.088 to 0.59 μmoles/min/g), and the free glucose-6-phosphatase and hexokinase activities were decreased by 20% and 28%, respectively. Similar changes were seen in the animals treated with the 3.1 mg/kg/day dose; no

dose-effect relationship was found. The findings indicate a transient activation of the oxidative processes in the mitochronia and cytoplasm after 1 mo of treatment, and a damage of the mitochrondrial membrane, accompanied by the solubilizaton of succinate dehydrogenase, after 6 mo of treatment.

79-0958. Reinke, L. A.; Stohs, S. J.; Rosenberg, H. (Dep. Biomed. Chem., Coll. Pharm., Med. Cent., Univ. Nebraska, Omaha, NE 68105) **Increased aryl hydrocarbon hydroxylase activity in hepatic microsomes from streptozotocin-diabetic female rats.** *Xenobiotica* 8(12): 769-778; 1978. (43 references)

In streptozotocin-induced diabetic male rats, hepatic microsomal aryl hydrocarbon hydroxylase (AHH) activity was depressed to less than control values, but was increased in microsomes from diabetic female rats. Insulin treatment of diabetic animals returned the altered AHH activity to control values in both sexes of rats. Hepatic microsomal AHH activity was increased over control values in both sexes of diabetic mice. Protection of female rats from the diabetogenic effects of streptozotocin by nicotinamide pretreatment also prevented the increase in AHH activity observed in unprotected animals. Treatment of control and diabetic female rats with 3-methylcholanthrene resulted in larger increases in hepatic AHH activity in control animals, but similar increases in cytochrome P448 content occurred in both treatment groups. Differential stimulatory or inhibitory effects on AHH activity were observed after the addition of SKF 525-A, metyrapone, and rotenone to hepatic microsomes *in vitro* from control an diabetic female rats. However, similar stimulatory responses in AHH activity were observed after additon of α-naphthoflavone to microsomes from both treatment groups.

79-0959. Tanaka, A.; Kanou, K.; Ujiie, A. (Gumma Prefect. Inst. Environ. Pollut., Gumma, Japan) **[Results of acute toxicity test of larvicides to *Lebistes reticulatus*.]** *Yosui To Haisui (Water and Waste Water)* 20(12): 1494-1502; 1978. (16 references) (Japanese)

In order to find out the cause of a large scale death of carp in a pond, a simple method for detecting the substance was investigated using gas chromatography. *o*-Dichlorobenzene was detected at 9.4 μl/l in a water specimen from the pond. It was presumed that a larvicide (against *Musca domestica*) had contaminated the pond and TLm studies of a representative, commercially available, larvicide (Fusisol) was determined using *Lebistes reticulatus* as the test fish. Twenty-four hr TLm values for *o*-dichlorobenzene and Fusisol were 26-28 and 11.5 μl/l, respectively. It was found that Fusisol was deactivated when left in water, especially in the presence of the fishes. The higher toxicity shown in the test is attributed to the presence of other toxic ingredients in the formulation. The carp kill was attributed to the contamination of the pond by a larvicide, presumably Fusisol, at a rate of about 13 μl/l.

See also 79-0756, 79-0759, 79-0771, 79-0784 *and* 79-0792.

79-0960. Becconsall, J. K. (Corp.-Lab., Imp. Chem. Ind. (ICI) LTD., Runcorn, Cheshire WA7 4QE, England) **Determination of trace organic pollutants in water by proton magnetic resonance spectroscopy of solvent extracts.** *Analyst (London)* 103(12): 1233-1238; 1978. (9 references)

Extraction with carbon tetrachloride followed by proton magnetic resonance spectroscopy, using a pulsed Fourier transform spectrometer with external field-frequency lock, has been investigated as a method for identifying and determining trace organic pollutants in water. The resulting spectra can be used as fingerprints in order to identify pollutants, and for quantitative measurements on specific compounds. The method is useful for all hydrogen-containing compounds that are efficiently extracted by the solvent, including hydrocarbons, halogenated hydrocarbons and organochlorine pesticides. Measurements can be made over a wide range of pollutant concentrations, from heavily polluted effluents to waters containing as little as 15 μg/l of alkanes. (Author abstract by permission)

79-0961. Greenhalgh, R.; Shoolery, J. N. (Chem. & Biol. Res. Inst., Agric. Canada, Ottawa, Ont. K1A OC6, Canada) **Analysis of organophosphorus insecticide and formulations for contaminants by phosphorus-31 Fourier transform nuclear magnetic resonance spectrometry.** *Anal. Chem.* 50(14): 2039-2042; 1978. (11 references)

Technical grade samples and formulations of fenitrothion were analyzed by ^{31}P Fourier transform nuclear magnetic resonance spectrometry. The precision of the method was acceptable with a standard analysis time of 8.3 min in the presence of a relaxing agent. Rapid assay (1 min) of the technical grade samples was also useful as a screening procedure. Up to eight phosphorus contaminants were detected, the major ones being bis(fenitrothion) and *S*-methylfenitrothion. The quantitated NMR data agreed reasonably well with that obtained by high performance liquid chromatography. The latter technique detected fewer contaminants but revealed the cresol as another major contaminant. (Author abstract reprinted by permission of the American Chemical Society)

79-0962. May, T. W.; Stalling, D. L. (Columbia Natl. Fish. Res. Lab., Route #1, Columbia, MO 65201) **Double-reservoir rotoevaporation vessel for residue analysis.** *Anal. Chem.* 51(1): 169-170; 1979. (3 references)

Although automation of gel permeation techniques for lipid-residue separation has increased the number of extracts that can be cleaned and processed, the sample preparation for pesticide residue analysis still involves numerous manual transfers. The development of a double-reservoir rotoevaporation vessel allows collection, concentration, and final volume calibration of column eluates. Eluted solvents are collected in the vessels, and rotoevaporated to a small volume in the lower calibrated reservoir. A suitable solvent is used to rinse the walls, and allow sample calibration. Two vessels, a 250 ml round bottom flask with a 10 ml volumetrically calibrated spherical reservoir (± 1%) and a 100 ml round bottom flask with a 5 ml reservoir, are made with 24/40 standard taper joints and a 15 mm i.d. opening between the upper and lower reservoir. These vessels eliminate six quantitative transfer steps.

79-0963. Whiteoak, R. J.; Reary, J. B.; Overton, K. C. (Fisons Ltd., Agrochem. Div., Chesterford Park Res. Stn., Essex, England) **Bendiocarb.** In: *Analytical Methods for Pesticides and Plant Growth Regulators.* Zweig, G., Sherma, J., eds. (Academic Press: NY) 10(Chapter 1): 3-17; 1978. (5 references)

Bendiocarb, a wide-spectrum insecticide, has good residual activity after soil, or foliar applications. Possible use of this insecticide for agricultural applications is being considered with application which will have some systemic activity. For use as a seed dressing the chemical is formulated as an 80% wettable powder and in this form the active ingredient is stable during storage for 12 mo at 40°C. The recommended method to be used for analysis of a formulation consists of pyrolysis of the chemical in the flash heater of a gas chromatograph, with the products being separated on a polyethylene glycol adipate-phosphoric acid column. For analysis of the chemical as a residue in either foodstuffs or soil, the analysis permits determination of bendiocarb itself and its primary degradation product, a phenol, either separately or as a total residue. The procedure is based on extraction with an organic solvent such as dichloromethane, diethylether, or acetonitrile. Derivatization involves hydrolysis of the carbamate in an alkaline buffer and simultaneous formulation of the 2,4-dinitrophenyl ether.

79-0964. Gunew, D. S. (ICI Aust. Ltd., Ascot Vale, Victoria, Australia) **Bioresmethrin.** In: *Analytical Methods for Pesticides and Plant Growth Regulators.* Zweig, G., Sherma, J., eds. (Academic Press: NY): 10(Chapter 2): 19-29; 1978. (11 references)

Bioresmethrin is one of the most effective broad spectrum insecticides available today and for agricultural purposes is useful in protecting stored food against insect attack. Gas chromatographic methods which are capable of separating the isomers of resmethrin are applicable to the determination of bioresmethrin. For the analysis of bioresmethrin residues in wheat, two methods are recommended. In both methods recoveries have been 92.0 to 101.5% at the 0.5 ppm level and 90.8 to 96.7% at the 0.3 ppm level. The limits of detection are 0.02 ppm of bioresmethrin on wheat. In the first method the raw extract from the wheat sample is cleaned-up on a column of alumina, and, subsequent to evaporation of the eluate, addition of internal standards, and volume adjustment, a portion of the extract is injected into a microparticulate silica gel column filled with a precolumn. A variable wavelength spectrophotometer set at 225 is used as the detector. Use is made of peak height ratios to determine the concentration of bioresmethrin in the wheat. The second method described is a single injection cleanup and analysis method which obviates the need for a separate cleanup step.

79-0965. Weeren, R. D.; Eichler, D. (C. H. Boehringer Sohn, Hamburg, BRD) **Bromophos.** In: *Analytical Methods for Pesticides and Plant Growth Regulators.* Zweig, G., Sherma, J., eds. (Academic Press: NY): 10(Chapter 3): 31-40; 1978. (5 references)

Bromophos, an organophosphorus insecticide, is effective against a wide range of sucking and biting insects and inhibits acetylcholinesterase activity in the erythrocytes and brains of test animals. The chemical is available as a wettable powder, granular dust, seed dressing, emulsifiable concentrate, fog solution, and aerosol. It can be used along with other insecticides and fungicides. For residue analysis several methods have been proposed for detection in crops, animal products, soils, and water. The procedure described includes determination of bromophos residues in beets, bread, butter, cereals, fats, fruit, meat, milk, oils, and oil containing crops, potatoes, soil, straw of cereals, and vegetables. The method relies on the extraction of the residue with an appropriate solvent, cleanup by partition and subsequent column chromatography, and determination of the bromophos content by gas chromatography using a phosphorus-specific flame ionization detector. The limit of detection is about 0.001 ppm for water, and 0.01 ppm for the other materials named.

79-0966. Weeren, R. D.; Eichler, D. (C. H. Boehringer Sohn, Hamburg, BRD) **Bromophos-ethyl.** In: *Analytical Method for Pesticides and Plant Growth Regulators.* Zweig, G., Sherma, J., ed. (Academic Press: NY): 10(Chapter 4): 41-43; 1978. (2 references)

Bromophos-ethyl is effective against a wide range of sucking and chewing as well as biting insects whose major toxic effect is in its inhibition of the acetylcholinesterase activity in the erythrocytes and brain of test animals. Mosquito fish were not affected in tests by 1 kg a.i./ha of water surface. Concentrations up to 0.1% a.i. in 600 l/ha were not toxic to bees. Concentrations above this level were toxic to bees. The chemical is available as wettable powder, granular ultra-low volume concentrate, emulsifiable concentration, and dip formulation and is completely compatible with other insecticides and fungicides. The procedure for residue analysis of bromophos-ethyl is the same as in the case of bromophos. The method relies on the extraction of the residue with an appropriate solvent, cleanup by partition and subsequent column chromatography, and determination by gas chromatography using a phosphorus-specific flame ionization detector.

79-0967. Suzuki, H. K.; Atallah, Y. H.; Whitacre, D. M. (Velsicol Chem. Corp., Chicago, IL) **Chlordane.** In: *Analytical Methods for Pesticides and Plant Growth Regulators.* Zweig, G., Sherma, J., eds. (Academic Press: NY): 10(Chaper 5): 45-47; 1978. (14 references)

Chlordane has appeared in environmental and epidemiological samples thus necessitating more rigid residue analysis methods than have been used in the pest. Electron capture gas chromatography can be used in this field with excellent results, for due to the highly chlorinated nature of the chemical in question, chlordane is detectable to picogram amounts by this method. Reference is made to the *Analysis of Pesticide Residues in Human and Environmental Samples* , by Thompson in 1974 for methods of analysis of animal tissues, blood, excreta, or urine, but caution is advised that results may be misinterpreted. Reference is also made to a systematic study of four quantitation methods as applied to field crops for chlordane residue analysis as reported by Cochrane. In such analysis the importance of adeuqate gas chromatographic peak resolution and confirmation of observed residues cannot be overemphasized. Routine confirmation is recommended using thin-layer chromatography and ρ values, derivatization, and mass spectrometry.

79-0968. Lynch, V. P. (Murphy Chem. Ltd., Wheathampstead, Hertfordshire, England) **Chlormephos.** In: *Analytical Methods for Pesticides and Plant Growth Regulators. Zweig, G., Sherma, J., eds. (Academic Press: NY):* 10(Chapter 6): 49-55; 1978. (2 references)

Chlormephos is an effective soil insecticide for controlling wireworms, millipedes, and symphilids which are hazards to maize and sugar beet growers. It is also effective against other soil pests which hinder crop development. It is available as a granular formulation containing 5% active ingredients under the trade name Dotan. For analysis of technical material and of formulations it is recommended that determination be made by a gas-liquid chromatography procedure using a flame ionization detector and employing EPTC as an internal standard. For residue analysis the sample is extracted with dichloromethane in the presence of sodium sulfate which serves as a dehydrating agent. After a cleanup using column chromatography, chlormephos and its oxygen analog are determined on a gas-liquid chromatograph fitted with an alkali flame ionization (thermionic) detector. The method allows for good, reproducible results. The method is sensitive to less than 0.01 ppm. Recovery of chlormephos at the 0.01 to 2.0 ppm level ranges from 66 to 100%. Recovery values for the oxygen analog of chlormephos are in the range of 55 to 80%.

79-0969. Rabenort, B. ; De Wilde, P. C.; De Boer, F. G.; Korver, P. K.; DiPrima, S. J.; Cannizzaro, R. D. (Philips-Duphar Res. Lab., Weesp, The Netherlands) **Diflubenzuron.** In: *Analytical Methods for Pesticides and Plant Growth Regulators.* Zweig, G., Sherma, J., eds. (Academic Press: NY): 10(Chapter 7): 57-72; 1978. (13 references)

Diflubenzuron is a stomach poison which acts by interfering with the deposition of insect chitin. A species-dependent ovicidal effect has also been demonstrated by contact activity on the cotton leaf worm, *Spodoptera littoralis.* It is not effective against sucking insects as it does not penetrate into the plant tissue. The chemical is effective against leaf-feeding larvae in forests, top fruit, field crops, and horticultural crops at rates of between 1.5 and 30 g a.i./100 l of spray liquid. It is effective against mosquito larvae at 20 to 45 g a.i./ha water surface, and against fly larvae at 0.5 to 1.0 mg a.i./m^2 surface area. Avian toxicity is low. No notable signs of toxicity were noted in mallard ducks and bobwhite

quail at dose levels up to 4640 ppm in their food. For rainbow trout the LD50 is 140 ppm, and for bluegill sunfish this level is 135 ppm. Diflubenzuron is dissolved in dioxane and determined by HPLC on Lichultralow volume formulation containing 5% diflubenzuron. It is also available as a 45% oil dispersible concentrate. Two general types of assay procedures are available for residues of diflubenzuron- high pressure liquid chromatography and gas chromatography. The recommended method calls for the extraction of the residues from the homogenized sample with acetonitrile or actonitrile: water, and purification by various cleanup procedures. The cleaned up extract is then hydrolyzed under acidic conditions to yield 4-chloroaniline, followed by derivatization with heptafluorobutyric anhydride to give the corresponding anilide, which can be analyzed by gas chromatography with electron capture detection.

79-0970. Suzuki, H. K.; Atallah, Y. H.; Whitacre, D. M. (Velsicol Chem. Corp., Chicago, IL) **Heptachlor.** In: *Analytical Methods for Pesticides and Plant Growth Regulators.* Zweig, G., Sherma, J., eds. (Academic Press: NY): 10(Chapter 8): 73-74; 1978. (2 references)

Methods for the analysis of heptachlor residues are reviewed. These residues are separated and quantitated into the various components of technical heptachlor through general methods for chlorinated and phosphated pesticides. The various components of technical heptachlor include about 72 to 74% heptachlor, 20 to 22% trans-chlordane, and 4 to 8% trans-nonachlor. The official final action method (Active Chlorine Method) and the gas chromatographic method of the Association of Official Analytical Chemists are recommended for the analysis of heptachlor.

79-0971. Nakagawa, T.; Kanauchi, M. (Jap. Agric. Chem. Co., Ltd., Osaka, Japan) **Isothioate.** In: *Analytical Methods for Pesticides and Plant Growth Regulators.* Zweig, G., Sherma, J., eds. (Academic Press: NY): 10(Chapter 9): 75-82; 1978.

Isothioate, a systemic insecticide, is effective against several insects which attack agricultural crops such as aphids, mites, and lace bugs. The insecticide is available as a 4% granule and a 30% emulsifiable concentrate. For determinations of isothioate in technical and formulated products, a thin-layer chromatography phosphorus colorimetric method is noted which allows determination to be made without an analytical standard of isothioate. A second method is also noted which is a hydrogen flame ionization gas-liquid chromatography method and is both simple and convenient with the capability of being suited for quality control measurements. The recommended method to be used for analysis of isothioate residues calls for extraction of the iosthioate from samples with acetonitrile. Gas chromatography is used for carrying out the determination using an alkali flame ionization detector. Cleanup procedures are not necessary for this method as the detector has a very high sensitivity and selectivity for this particular insecticide. The sensitivity of the method is 0.003 ppm, based on a 50 g sample.

79-0972. Nakamura, T.; Yamaoka, K. (Agric. Chem. Res. Lab., Sankyo Co., Ltd., Shiga-ken, Japan) **Isoxathion.** In: *Analytical Methods for Pesticides and Plant Growth Regulators.* Zweig, G., Sherma, J., eds. (Academic Press: NY): 10(Chapter 10): 83-94; 1978. (3 references)

Isoxathion, a broad-spectrum insecticide, is useful for controlling insects on various plants such as fruit trees, vegetables, rice, tea, tobacco, and ornamental plants. It is effective against soil pests as well as green-leaf insects belonging to Hemiptera, Lepidoptera, Coleoptera, Diptera, and Orthoptera groups. Mammalian toxicity is moderate as the chemical is readily metabolized in rats to nontoxic compounds. Isoxathion is available as a 25% or 50% emulsifiable concentrate, a 40% wettable powder, a 2% dust, and a 3% fine granular formulation. For analysis of the formulation a gas chromatographic method is recommended with a hydrogen flame ionization detector using *p,p'*-DDT as an internal standard. Those formulations which are emulsifiable concentrates are diluted to an appropriate concentration with acetone. Formulations which are dust or fine granules are extracted with acetone and diluted to an appropriate concentration with acetone. Isoxathion residue analysis is performed using a gas chromatograph equipped with a phosphorus-sensitive flame photometric or foam thermionic detector. The residues are extracted with a solvent, and interfering substances are removed by liquid-liquid partitioning and Florisil or alumina column chromatography.

79-0973. Dunham, L. L.; Miller, W. W. (Stoner Lab., Santa Clara, CA) **Methoprene.** In: *Analytical Methods for Pesticides and Plant Growth Regulators.* Zweig, G., Sherma, J., eds. (Academic Press: NY): 10(Chapter 11): 95-109; 1978. (19 references)

Methoprene is an insect growth regulator which, as a juvenile hormone mimic, exhibits morphogenetic rather than direct toxic activity against certain dipteran and other insects. The chemical decomposes rapidly in the environment by both aquatic and soil microorganisms, and by sunlight. Methoprene is available as a 10% a.i. microencapsulation formulation, as a 4% a.i. granular briquet, and as a 10% a.i. premix. For residue analysis it is noted that the convenience of using element-specific detectors for gas chromatogrpahy is not possible due to the fact that methoprene is composed only of carbon, hydrogen, and oxygen. Microanalytical separations needed to detect the compound in the ppb range are available through gas chromatography with flame ionization detectors. The nonspecificity of flame ionization detectors dictates that thorough cleanup of residue extracts should be accomplished with alumina anf Florisil chromatography. The residue determination is confirmed by combined gas chromatography mass spectrometry and gas chromatography on columns of differing polarity.

79-0974. Oi, N.; Shimada, H.; Hiroaki, O.; Horiba, M.; Kitahara, H. (Inst. Biol. Sci., Sumitomo Chem. Co. Ltd., Takarazuka, Hyogo, Japan) **[Gas-chromatographic resolution of enantiomers of organophosphor amidothioate on an**

optically active stationary phase. Second report on the studies of analysis of optical isomers.] *Bunseki Kagaku (Anal. Chem.)* 28(1): 64-65; 1979. (Japanese)

Gas-chromatographic resolution of enantiomers of organophosphor- amidothioate, containing an asymmetric phosphorous atom on a chiral stationary phase, was studied, and satisfactory results were obtained. (±)-*O*-Ethyl- *O*-(2-nitro-5- methylphenyl) -*N*-isopropyl- phosphoramidothioate was resolved within about 2.3 hr at 180°C. A 60 m X 0.25 mm glass capillary open tubular column coated with *N,N*-(2,4- (6-ethoxy-1,3,5-triazine) diyl)- bis(L- valyl-L- valyl-L-valine isopropyl ester) was used. Consequently, the optical purity of this herbicide can be easily determined from the ratio of the resolved peak areas. It is noticeable that organophosphor amidothioates, containing no asymmetric carbon atoms, have been resolved on an optically active stationary phase containing only asymmetric carbon atoms.

79-0975. Holmstedt, B. (Dep. Toxicol., Swed. Med. Res. Counc., Karolinska Inst., Stockholm, Sweden) **Mass fragmentography of TCDD and related compounds** In: *Dioxin: Toxicological and Chemical Aspects.* Cattabeni, F., Cavallaro, A., Galli, G., eds. (Spectrum Publ., Inc.: NY) Chapter 3: 13-25; 1978. (24 references)

The development and applications of mass fragmentography (MF) in TCDD analysis are reviewed. MF is the exclusive use of the mass spectrometer for the mass-specific recording of pre-selected ions by sequentially focusing the instrument where ion abundance is to be measured. Multiple ion detection is possible by the use of GC-MS. The separating ability of GC and the extremely high sensitivity of MS enables the instrument to analyze complex mixtures. The identification of TCDD in 2,4,5-trichlorophenol is discussed.

79-0976. Buser, H. R. (Swiss Fed. Res. Stn., Wadenswil, Switzerland) **Analysis of TCDD's by gas chromatography-mass spectrometry using glass capillary columns.** In: *Dioxin: Toxicological and Chemical Aspects.* Cattabani, E., Cavallaro, A., Galli, G., eds (Spectrum Publ., Inc.: NY) (Chapter 4:) 27-41; 1978. (14 references)

OV-101 (nonpolar methyl silicone) and OV-17 (semi-polar methyl phenyl silicone) gas capillary columns of 20-30 m length, and 0.35-0.37 i.d. were prepared. The columns were operated at 207-220°C with He carrier gas (0.6 atm). The glass column was coupled via a fused platinum capillary into the ion source of a Finnigan 1015 D quadrupole MS. For mass fragmentography (MF) of TCDD's, a multiple ion monitoring attachment was used, and the ions at m/e 320, 322, and 324 were simultaneously recorded. Injection periods of 15 sec allowed about 95% of samples to be transferred to the column. Sample aliquots of 2 μl were injected. In a mixture of TCDD isomers 9 of 22 theoretically possible isomers were observed. The MF single or multiple ion detection resulted in far higher sensitivities than scanning whole spectra. The high specificity of MF was established by analyzing 2,3,7,8-TCDD in the presence of PCBs. Analyses of environmental samples from Zones A and B (high and low pollution sites) in Seveso were made.

79-0977. Freudenthal, J. (Natl. Inst. Public Health, Bilthoven, The Netherlands) **The quantitative determination of TCDD with different mass spectrometric methods.** In: *Dioxin: Toxicological and Chemical Aspects.* Cattabeni, F., Cavallaro, A., Galli, G., eds (Spectrum Publ., Inc.: NY) Chapter 5: 43-50; 1978. (7 references)

Different techniques of quantitative determination of TCDD in various sample materials from Seveso are compared. The analytical procedure in TCDD determination is step-wise: extraction, cleanup, GLC, MS. GC-MS procedures distinguish between high-resolution capillary, and low-resolution pack columns. The packed column has a broader peak, with more pronounced interference between different substances than capillary columns. The detection limit of the high resolution capillary GC-MS column is lower in integrated high-resolution mass spectrum methods. Pure MS methods have been adapted particularly for the analysis of TCDD in fatty tissues. The integrated high-resolution MS may have shorter analysis time than the GLC-MS method, but this difference is small.

79-0978. Harless, R. L.; Oswald, E. D. (US EPA, Research Triangle Pa ', NC) **Low and high resolution gas-chromatography -mass spectrometry (GC-MS) method of analysis for the presence of 2,3,7,8- tetrachloro dibenzo-*p*-dioxin (TCDD) in environmental samples.** In: *Dioxin: Toxicological and Chemical Aspects.* Cattabeni, F., Cavallaro, A., Galli, G., eds. (Spectrum Publ., Inc.: NY) Chapter 6: 51-57; 1978. (8 references)

The high-resolution GC-MS method of TCDD determination in environmental samples is extremely sensitive and specific. The detection limit is 8 ppt. A two-stage Biemann-Watson separator is used to interface a Varian model 2700 GC and the MS. Optimum high resolution MS conditions are established with PFK, m/e 319, the magnet current turned to m/e 328, ^{35}Cl-TCDD. The accuracy attained for 20-100 pg standards and QC samples in benzene is within ± 15% of theoretical value. An efficient analytic cleanup procedure is essential for meaningful GC-MS analysis. Criteria used to define the presence of TCDD in environmental samples include: TCDD peak must be 2.5 x noise; a peak in both m/e 320 and m/e 322; peak intensity ratio 0.8-1.0; and the correct GC retention times.

79-0979. O'Keefe, P. W. (Dep. Chem., Harvard Univ., Cambridge, MA) **A neutral cleanup procedure for TCDD residues in environmental samples.** In: *Dioxin: Toxicological and Chemical Aspects.* Cattabeni, F., Cavallero, A., Galli, G., eds. (Spectrum Publ., Inc.: NY) Chapter 7: 59-78; 1978. (16 references)

A neutral cleanup procedure for the separation of TCDD from lipids is described. Frozen beef fat and milk samples were extracted with hexane or cyclohexane and labeled with ^{37}Cl TCDD. The solutions were eluted on packed magnesia/Celite 545, alumina, and Florisil columns. Subsequent anlyses of TCDD residues were accomplished by direct probe dual ion high resolution MS. Comparisons between

acid-base, and neutral cleanup procedures for TCDD residues in milk are made.

79-0980. Bowes, G. W.; Mulvihill, M. J.; Simoneit, B. R.; Burlingame, A. L.; Risebrough, R. W. (Toxic Chem. Sect., Canadian Wildl. Serv., Ottawa, Ont., Canada) **Isolation and identification of chlorinated dibenzofurans from polychlorinated biphenyls (PCB) and from Yusho rice oil containing PCB.** In: *Dioxin: Toxicological and Chemical Aspects.* Cattabeni, F., Cavallero, A., Galli, G., eds (Spectrum Publ. Inc.: NY) Chapter 8: 79-98; 1978. (25 references)

The quantitative and qualitative identification of chlorinated dibenzofurans in PCB's and rice oil are discussed. Isolation of dibenzofurans include dissolving commercial formulations of PCB's in hexane and passing through a large column of Florisil. Three fractions of interest then further partitioned on alumina columns prior to gas chromatographic identification. Chromatographic peaks isolated for high resolution MF were identified as tetra-, penta-, and hexa chlorinated dibenzofurans; PCB isomers and hexachloro-, and heptachloro naphthalene were also isolated. Chlorinated dibenzofuran concentrations in Aroclor PCB's ranged from 0 μg/g (Arclor 1016) to 2.0 μg/g (Aroclor 1248). Analysis of rice oil that caused a single epidemic of Yusho disease among Japanese consumers indicated contamination of the oil by 800-1000 ppm Kanechlor 400 PCB. Six chlorinated dibenzofurans were isolated from extracts of this product.

79-0981. Chmil', V. D.; Pilenkova, I. I.; Far'yanova, A. D.; Zorova, A. I. (All-Union Sci. Res. Inst. Hyg. & Toxicol. Pestic. Polymers & Plastic Mat., Kiev, USSR) **Opredelenie ostatochnykh kolichestv benzilovogo i polietilenglikolevogo efirov 2,4-dikhlorfenoksiuksusnoi kisloty v vode metodom gazozhidkostnoi khromatografii. [GLC determination of residues of benzyl and polyethylene glycol esters of 2,4-D in water.]** *Gig. Sanit.* 43(10): 56-58; 1978. (5 references) (Russian)

GLC determination of residues of benzyl and polyethylene glycol esters of 2,4-D (2,4-DBE and 2,4-DPE, respectively) in water is described. Following extraction with diethyl ether, the esters were hydrolyzed to 2,4-D, and methylated with diazomethane after the addition of 2,4,5-T as an internal standard. The substances were then extracted with *n*-hexane for gas chromatographic analysis with electron capture detector. To obtain the quantities of 2,4-DBE and 2,4-DPE, the result obtained for 2,4-D methyl ester must be multiplied by the respective factors of 1.4077 and 2.7280. The recovery rate is 98% for 2,4-DBE and 90% for 2,4-DPE. The sensitivity is 0.002 mg/l for 2,4-DBE and 0.005 mg/l for 2,4-DPE.

79-0982. Krasnykh, A. A. (All-Russian Sci. Res. Inst. Plant Prot., Ramon' Voronezh Oblast, USSR) **Primenenie tonkosloinoi khromatograffi dlya opredeleniya pirimikarba i aktellika. [Use of TLC for determining pirimicarb and Acetellic.]** *Gig. Sanit.* 43(11): 92-94; 1978. (1 reference) (Russian)

TLC method for the joint determination of pirimicarb and actellic pirimiphos-methyl in water, soil and plant materials is described. The water and soil samples are extracted with chloroform, the plant samples with diethyl ether. The extract is then cleaned on a chromatographic column, or by redistribution in a hydrochloric acid-containing medium and subsequent TLC, using benzene: *n*-hexane (1:5) and acetone: hexane (1:5) as a solvent systems. The pesticide spots are visualized in UV light or with bismuth nitrate with potassium iodide in sulfuric acid. A correlation was found between the pesticide content and the intensity of chloration or fluorescence in the concentration range of 2-40 μg. The sensitivity of the method amounts to 2-3 μg per sample. The recovery rate is 83-97%.

79-0983. Rogovskiy, D. Yu.; Minenko, A. K.; Pastushenko, T. V. (Lvov Med. Inst., Lvov, USSR) **Fotokolorimetricheskoe opredelenie 3-metil-4-metilmerkaptofenola v vode. [Photocolorimetric determination of 3-methyl-4-methylmercaptophenol in water.]** *Gig. Sanit.* 43(11): 109-110; 1978. (Russian)

Photocolorimetric method for the quantitative determination of 3-methyl- 4-methylmercaptophenol, an intermediate in Baytex (fenthion) synthesis, in water is described. A 20 ml water sample is combined with 3 ml of silicomolybdic acid, and the mixture is left standing for 20 min. Then, 2 ml of 10% ammoniacal solution are added, and the optic density of the blue solution is measured after 10 min. The quality of 3-methyl- 4-methylmercaptophenol is determined from a calibration curve. The Lambert-Beer law is satisfied in the range of 2.5-35 μg/ml. The relative error is ± 3.7%.

79-0984. Kucher, A. G.; Rakov, A. A.; Sapegin, D. I. (Author address not given) **Kolichestvennoe opredelenie na khromatogramme khlororganicheskikh pestitsidov v pomoshch'yu mikrofotometra MF-2. [Quantitative chromatographic determination of organochlorine pesticides using MF-2 microphotometer.]** *Gig. Tr. Prof. Zabol.* (10): 57-58; 1978. (7 references) (Russian)

A microphotographic method for the quantitative determination of organochlorine pesticides, visualized on an alumina plate chromatogram with silver nitrate, is described. The spots of the pesticides, along with two reference spots, are photographed by means of an MF-2 microphotograph, and the quantity of the test substance is determined from the difference of the spot intensities.

79-0985. Eng, J. F. (Purdue Univ., West Lafeyette, IN) **Designs of electron capture systems with high specificity for the analysis of pesticide residues.** *Diss. Abstr. Int. B* 39(5): 2255; 1978.

A system employing coherent solute switching and synchronous demodulation has been developed for pesticide analysis. Electron attachment is used as the basic switching mechanism. Detection of the modulated solute stream is through an electron capture detector optimized for fast re-

sponse times. Investigations involving source isotopes, detector geometry, cell spacing and electrostatically focused reactive volume have led to several practical designs. The final optimized electron capture reactor-detector combination exhibited switching frequencies in excess of 6 Hertz; nominal operating temperature of 300°C; low internal volume, less than 150ul; and a straight-sensitivity, selectivity, and linearity for a series of halogen-, phosphorous-, and sulfur-containing pesticides. (Author abstract by permission. Copies of the thesis are available from University Microfilms, order No. 7821436)

79-0986. Gordts, L. A.; Vandezande, A.; Van Cauwenberge, P. P.; Van Haver, W. (Inst. Hyg. & Epidemiol., B-1050 Brussels, Belgium) **Quantitative thin-layer chromatographic determination of Br- residues in crops after soil treatment by methyl bromide.** *J. Agric. Food Chem.* 27(1): 132-134; 1979. (13 references)

A procedure is described for the quantitative thin-layer chromatographic determination of Br residues in crops grown on soils treated with methyl bromide. The samples are dried and calcinated. The ashes are extracted with water. The Br containing solution is spotted on a heated silica gel coated chromatographic plate. The plate is covered with a glass plate just above the spots, sprayed successively with a fluorescein solution and a mixture of glacial HOAc and 30% H_2O_2. After heating, Br reacts with fluorescein to form eosin. Bright red spots appear on a yellow background. This reaction is specific for Br. After development of the plate, fluorescein, eosin, and small amounts of other brominated products of fluorescein are distinctly separated. The eosin spots are marked and scraped off. The eosin calibration curve is linear from 10 to 90 ppm Br. The results obtained by this method are compared with an X-ray fluorescence spectroscopic technique. (Author abstract reprinted by permission of the American Chemical Society.)

79-0987. Cessna, A. J. (Res. Stn., Agric. Canada, Regina, Saskatchewan S4P 3A2, Canada) **Determination of the herbicide dinoseb in fababeans.** *J. Agric. Food Chem.* 27(1): 191-193; 1979. (13 references)

An analytical method for determining residues of the herbicide dinoseb (2-*sec*-butyl-4,6-dinitrophenol) in fababean (*Vicia faba* L.) green tissue and mature beans has been developed using electron-capture gas chromatographic detection. The fababeans were treated with preemergence applications of dinoseb amine at 4, 6, and 8 kg/ha. The maximum dinoseb residue found in the mature beans was 8 ppb, the limit of detection being 2 ppb based on a 1-g fresh-weight equivalent. Recoveries were in the order of 60% at the 50 ppb fortification level. (Author abstract reprinted by permission of the American Chemical Society.)

79-0988. Hirvi, T.; Pyysalo, H.*; Savolainen, K. (Food Res. Lab., Tech. Res. Cent. Finland, SF-02150 Espoo 15, Finland) **A glass-cappillary gas-liquid chromatography method for determining ethylenethiourea without derivatization.** *J. Agric. Food Chem.* 27(1): 194-195; 1979. (15 references)

Ethylenethiourea, a toxic metabolite of ethylenebis (dithiocarbamate) fungicides, was detected with high sensitivity and selectivity, without preparation of derivatives, by a high-resolution glass capillary GLC method. The method was applied to analytical ethylenethiourea research problems. (Author abstract reprinted by permission of the American Chemical Society.)

79-0989. Edgerton, T. R.; Moseman, R. F. (Environ. Toxicol. Div., Health Effects Res. Lab., US EPA, Research Triangle Park, NC 27711) **Determination of pentachlorophenol in urine: the importance of hydrolysis.** *J. Agric. Food Chem.* 27(1): 197-199; 1979. (10 references)

A gas chromatographic method for more reliable determinations of pentachlorophenol (PCP) in urine has been developed. After hydrolysis and extraction the sample was reacted with diazomethane to produce the methyl ether of PCP prior to analysis by electron-capture gas chromatography. An acid alumina column clean-up system was developed to remove interferences from the sample extracts and allow detectability of 1 ppb PCP. Average recoveries of greater than 90% were obtained from urine fortified with known amounts of PCP. The importance of hydrolysis and comparisons of present methodologies will also be presented. (Author abstract reprinted by permission of the American Chemical Society.)

79-0990. Blanchet, P. F. (Dep. Chim. Biol., Univ. Quebec, Trois Rivieres, Quebec G9A 5H7, Canada) **Extraction of chlorpyrifos-methyl residues from aqueous solution and analysis by flame photometric gas chromatography.** *J. Agric. Food Chem.* 27(1): 204-206; 1979. (14 references)

Methods for extractions and analyses of samples of natural water and basal salt medium for bacterial growth containing traces of chlorpyrifos-methyl have been developed. Aqueous solutions were extracted by high-speed stirring after addition of a small volume of hexane in the sample. Extracts of lower concentration were concentrated by evaporation prior to analyses by flame photometric gas chromatography to yield a detection limit of 1 ppb. The extracts from all aqueous solutions were found to be relatively stable for 45 days. The efficiency of the extraction methods was near 100% for the water samples and near 95% for the basal salt medium samples under the experimental conditions described. (Author abstract reprinted by permission of the Amercian Chemical Society.)

79-0991. Stimac, R. M. (Moffett Tech. Cent., CPC Int. Inc., Argo, IL 60501) **Rapid florisil cleanup for analysis of chlorinated pesticide residues.** *J. Assoc. Off. Anal. Chem.* 62(1): 85-88; 1979. (12 references)

A modification of the current Florisil chromatographic cleanup procedure for pesticide residue analysis is presented. BY prewashing the Florisil column with a speci-

fied quantity of ethyl ether, many chlorinated pesticides, including dieldrin and endrin, can be eluted in one step. The demonstrated cleanup efficiency of the proposed method eliminates the need for further cleanup, since the concentrated eluate is suitable for gas chromatographic analysis. Recovery of 13 chlorinated pesticides in typical products of corn wet milling ranged from 85 to 115%. (Author abstract by permission)

79-0992. Holmstead, R. L.; Allsup, T. L.; Fullmer, O. H. (Div. Entomol. & Parasitol., Univ. California, Berkeley, CA 94720) **Characterization of a plant constituent interfering in the analysis of residues of 2,3-dihydro- 2,2-dimethyl- 3,7-benzofurandiol, a metabolite of carbofuran.** *J. Assoc. Off. Anal. Chem.* 62(1): 89-92; 1979. (7 references)

A plant breakdown product interfering with the analysis of 2,3-dihydro- 2,2-dimethyl- 3,7-benzofurandiol, a major metabolite of carbofuran, is a vanillin derivative and is identified as α-(4-hydroxy -3- methoxyphenyl)- ethanol (methyl-guaiacyl-carbinol). Procedures for the resolution of the interference are reported. (Author abstract by permission)

79-0993. Ott, D. E. (Dep. Entomol., Univ. California, Riverside, CA 92521) **Mechanized system for liquid chromatographic determination of 4-nitrophenol and some other phenolic pesticide metabolites in urine.** *J. Assoc. Off. Anal. Chem.* 62(1): 93-99; 1979. (11 references)

An analytical system for several urinary pesticide metabolites, which incorporates a high degree oe mechanization, has been developed. urine samples (ca 8 ml) are placed in a sampler module. An acid hydrolysis step, a steam distillation step, and a combined liquid chromatographic separation and UV absorption determinative step are performed automatically. At the slowest rate, a sample is analyzed every 24 min with a lower limit of detectability from 1 to 2 ppm added 4-nitrophenol in urine. The method, with minor adjustment of chromatographic conditions, also responds to < 5 ppm each of the other phenols derivable from the below-named (and some other) pesticides. Alternative conditions permit detection of < 1 ppm 1-naphthol. The method has the capability for assessing human exposure primarily to parathion, paraoxon, methyl parathion, and EPN, but also to carbaryl, Landrin, 2-phenylphenol, bromophos, bromophos-ethyl, iodofenphos, 2,4,5-trichlorophenol, 2,4,5-trichlorophenoxyacetic acid (2,4,5-T), fenoprop, trichloronat, and fenchlorphos. The applicability of the method was demonstrated by fortifying urine with phenolic standards, corresponding to the phenolic moieties as metabolically produced from these pesticides or to the phenolic parent pesticides. (Author abstract by permission, abridged.)

79-0994. Cochrane, W. P.; Lanouette, M. (Plant Prod. Div., Lab. Serv. Sect., Agric. Canada, Ottawa, Ont. K1A OC5, Canada) **High pressure liquid chromatographic determination of naphthaleneacetic acid residues in apples.** *J. Assoc. Off. Anal. Chem.* 62(1): 100-106; 1979. (15 references)

An ion-suppression reverse phase high pressure liquid chromatographic method is described for determining naphthaleneacetic acid (NAA) residues in apples. Samples are extracted with acidic chloroform, filtered through pre-acidified Hy-Flo Supercel, and cleaned up by acid-base partitioning. The extract can be successfully chromatographed on either a μLiChrosorb NH_2 or μBondapak C_{18} column and quantitated by using a variable wavelength ultraviolet detector set at 220 nm. The mobile phase is acetonitrile-water (20+80) buffered to pH 3.5 (μLiChrosorb column) or pH 5.2 (μBondapak column) and flowing at 1.0-2.0 ml/min. Recoveries ranged from 86 to 98%. The minimum detectable amount was 0.5 ng, which easily permitted the quantitation of 0.01 ppm NAA in 50 g sample. A fluorometric detector was 4 times as sensitive, using an excitatin wavelength of 220 nm and monitoring the emission at 340 nm. For this detector, the mimimum detectable amount was 0.12 ng NAA. (Author abstract by permission)

79-0995. Chau, A. S. Y.; Babjak, L. J. (Water Qual. Branch, Canada Cent. Inland Waters, Burlington, Ont. L7R 4A6, Canada) **Column chromatographic determination of mirex, photomirex, and polychlorinated biphenyls in lake sediments.** *J. Assoc. Off. Anal. Chem.* 62(1): 107-113; 1979. (11 references)

Mirex (dodeca chloro octahydro- 1,3,4- metheno- 2 *H*-cyclobuta [cd] pentalene) and photomirex (8-mono hydromirex) are separated from interfering polychlorinated biphenyls (PCB's) in lake sediments. Sediment samples were extracted with acetone-hexane (1+1) in an ultrasonic apparatus and the extracts were cleaned up on conventional Florisil columns. A charcoal-polyurethane column was used to quantitatively separate Mirex and photomirex from PCB's. Recoveries of mirex, photomirex, and PCB's from the spiked sediments were each > 95% at 0.1 to 3 ppb levels. (Author abstract by permission)

79-0996. Abdel-Kader, M. H. K.; Peach, M. E.; Stiles, D. A. (Dep. Soil Sci., Univ. Manitoba, Winnipeg, Manitoboa R3T 2N2, Canada) **Determination of ethylene dibromide in fortified soils by molecular emission cavity analysis using a modified extraction process.** *J. Assoc. Off. Anal. Chem.* 62(1): 114-118; 1979. (28 references)

A method is described for the detemrination of small quantities of ethylene dibromide (EDB) in soils. The EDB is distilled from an aqueous slurry of the fortified soil into a cooled mixture of acetone-isooctane, which is then decomposed in a Schloniger flask. The resultant hydrogen bromide is injected into an indium-lined cavity of a molecular emission cavity analysis instrument and is quantitated from the intensity of the InBr emission (λmax = 376 nm). The detection limit of EDB is less than 0.5 ppm. Recovery of EDB added to soils at 0.5-10 ppm was greater than 96%. (Author abstract by permission)

79-0997. Cox, R. H.; McKinney, J. D. (Environ. Biol. & Chem. Branch, NIEHS, Research Triangle Park, NC 27709) **Carbon-13 NMR spectra of some chlorinated polycyclodiene pesticides.** *Org. Magn. Reson.* 11(11): 541-546; 1978. (12 references)

Carbon-13 NMR spectrometry has recently become an important structural tool for identification of degradation products. The ^{13}C NMR spectra of 30 polycyclodiene systems, including aldrin, dieldrin, isodrin, endrin, heptachlor, heptachlor epoxide and their degradation products were studied. Chemical shifts were determined on the basis of comparison of the spectra, substitution effects derived for norbornanes, single, off-resonance decoupling experiments, and spectra obtained by using an added lanthanide shift reagent. Trends for the chemical shifts were found by applying substituent effects previously reported for norbornanes. Aldrin, dieldrin, endrin and their derivatives are discussed in detail.

79-0998. Hackwell, J. A.; Self, C. (Shell Biosci. Lab., Shell Res. Ltd., Sittingbourne Res. Cent., Kent ME9 8AG, England) **Pesticide analysis-what has HPLC to offer?** *Proc. Anal. Div. Chem. Soc.* 15(11): 307-309; 1978. (2 references)

High performance liquid chromatography is rapidly replacing gas chromatography pesticide analyses. The various types of equipment used at Shell Biosciences Laboratory are examined. Constant pressure pumps, commonly used as the solvent delivery system, are being replaced by constant flow, single- and dual-piston pumps. These are sometimes modified to help reduce solvent pulsing. Injection values, which are convenient and help reduce errors, are used for most routine analyses. Analytical columns of 0.1 or 0.2 m by 4.5 mm i.d. packed with microparticulate silica or alumina or bonded phase packing materials are commonly used in conjunction with solvents such as hexane, methanol, dichloromethane, diethyl ether, 1,4-dioxan, acetonitrile or water. Variable-wavelength ultraviolet detectors are used with both internal and external calibration. Both pack height and peak area are used for quantitation.

79-0999. Shapenova, G. Kh.; Talipov, Sh. T.; Orlik, I. A. (Tashkent I. V. Lenin State Univ., Tashkent, USSR) **Differentsial'no-kineticheskii metod razdel'nogo opredeleniya nekotorykh fosfororganicheskikh pestitsidov. [Differential kinetic determination of some organophosphorus pesticides.]** *Uzb. Khim. Zh.* (4): 8-13; 1978. (3 references) (Russian)

A kinetic method for the determination of sayphos (menazon), trichlorfon, DDVP (dichlorvos), dimethoate and their combinations is described. The method is based upon the ability of organophosphorus compounds to accelerate the oxidation of aromatic diamines (such as dianisidine) by hydrogen peroxide. The separate determination of the four pesticides without their preliminary separation is possible due to the fact that each of them accelerates the oxidation of *O*-dianisidine by hydrogen peroxide at different H_2O_2 concentrations. The sensitivity of the method amounts to 0.05 μg. The error does not exceed 20.8% for sayphos, 17.2% for trichlorfon, or 18.2% for DDVP and dimethoate.

79-1000. Fritschi, U.; Fritschi, G.; Kussmaul, H. (Inst. Wasser, Boden. & Lufthyg., Bundesgesund. Berlin, Berlin, BRD) **Mikrocoulometrische Summenbestimmung von schwer- und leichtfluechtigen Organochlorverbindungen im Wasser. [Microcoulometric determination of the sum of non-volatile and volatile organochlorine compounds in water.]** *Z. Wasser Abwasser-Forsch.* 11(5): 165-167, 170; 1978. (19 references) (German)

Microcoulometric method for determination of the sum of organochlorine compounds in water is described, and results of measurements are presented. The non-volatile organochlorine compounds were extracted from the water samples continuously with di-isopropyl ether. This extracting agent was found better for the extraction of polar compounds than hexane. Volatile organochlorine compounds were directly transferred by a nitrogen stream from the water sample into the combustion oven. The sum of the non-volatile and volatile organochlorine compounds was determined by microcoulometric titration of the chloride formed by combustion. Main river water samples were found to contain 7-256 μg of non-volatile organochlorine compounds/l. Drinking-water obtained by bank filtration contained 9.4-28 μg/l. The concentration of volatile organochlorine compounds in the river water ranged from about 50 to 1,000 μg/l.

See also 79-0792, 79-0797 *and* 79-0812.

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